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British Columbia Mining, Exploration and Development 1993 Highlights

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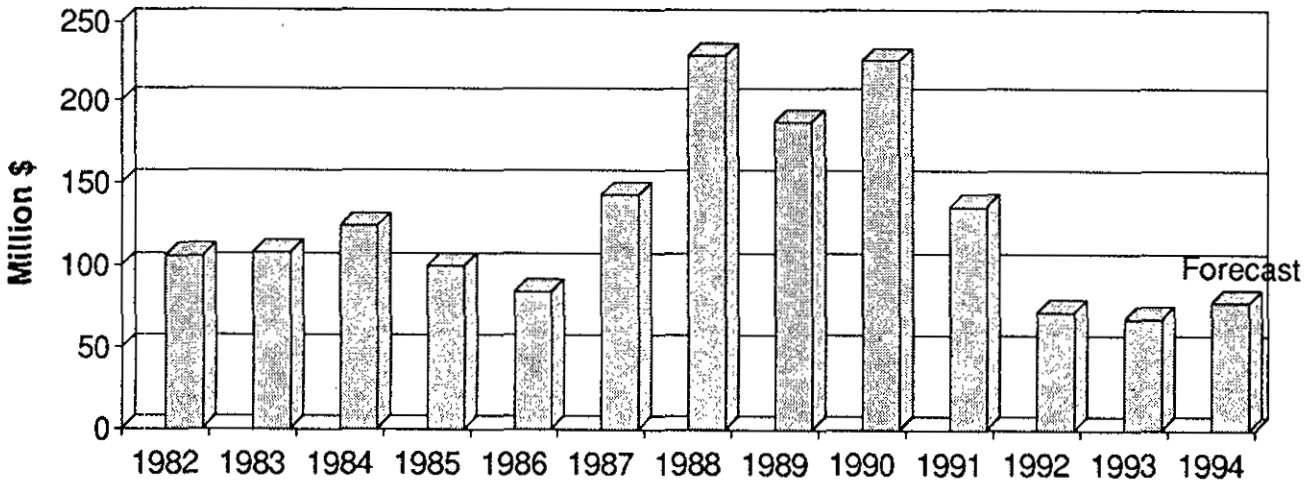
INTRODUCTION

The intense global competition for high-risk exploration dollars has been very noticeable in British Columbia. The exploration industry has experienced a year of decreased expenditures, however, several companies and individuals continued to conduct small to medium-sized programs, primarily in areas having a good database, known resources in the ground, and higher probability of development and production. Targets included many of the classic mineral deposit types for which British Columbia is well known. Several relatively recent discoveries such as **Eskay Creek, Red Mountain** and **Huckleberry** (East zone) have increased interest. The estimate for the number of claim units recorded in 1993 is down about 17% from 1992, but several restaked claims covered old properties with sufficient work completed on them to indicate potential. Custom milling facilities at **Premier, Equity Silver** and **Goldstream,** and a sharp rally in the price of gold beginning in April 1993, may enable small, high-grade, gold operations to start up, both in British Columbia and in Alaska. A number of advanced projects have entered the Mine Development Assessment Process, with many in the pre-feasibility stage. Industrial minerals are receiving increasing attention.

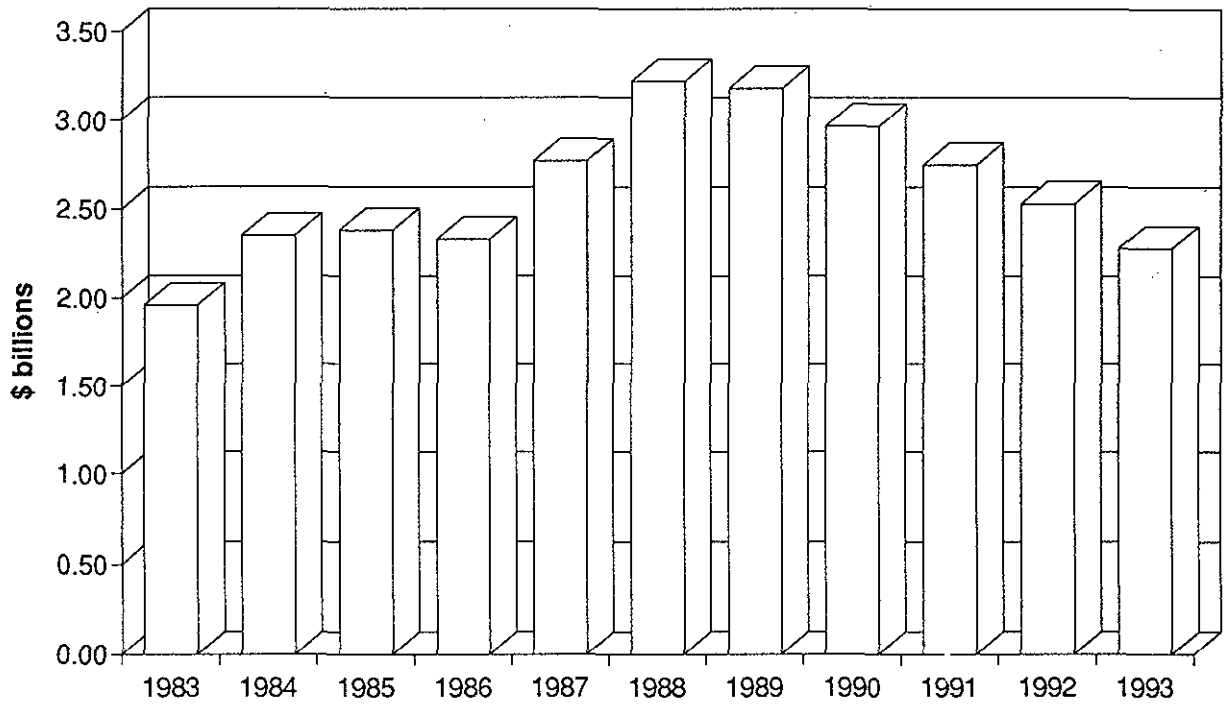
REGIONAL PERSPECTIVES AND TRENDS

Preliminary estimates indicate that total expenditures on mineral exploration projects in British Columbia during 1993 will be in the order of $45 to $50 million (all Canadian dollars unless otherwise stated). It is estimated that more than 50% of this figure will be spent in the northwest part of the province. This figure is compiled from estimates made by Ministry geologists on a project-by-project basis throughout the province and is an estimate of the actual total dollars spent on the ground. The official Mineral Statistics Survey estimates a total of $68 million. This figure includes non-property costs.



Source: MEMPR, Land Management and Policy Branch

Figure 1. Mineral exploration expenditures in British Columbia 1982-1993.



Source: MEMPR, Land Management and Policy Branch

Figure 2. Solid mineral production in British Columbia 1983 to 1994.

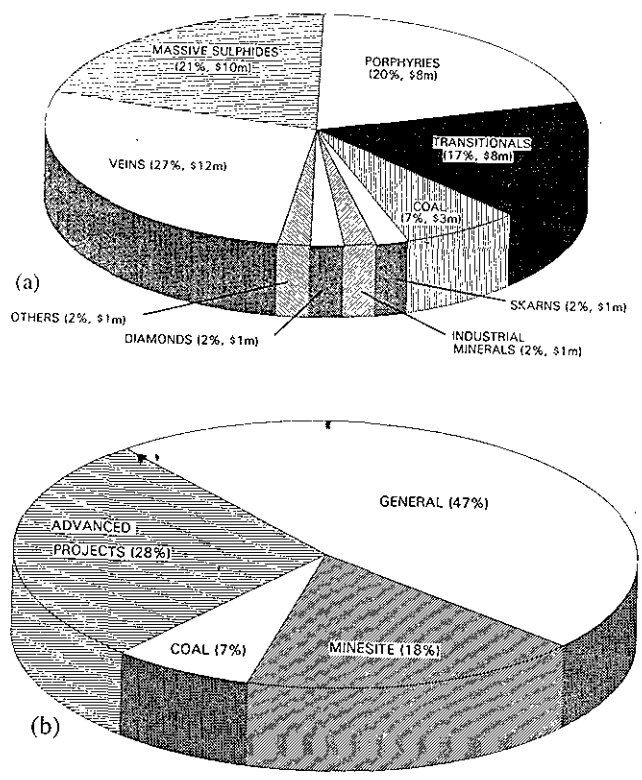


Figure 3. Exploration targets - 1993 (a) by deposit type (%, expenditures); (b) by level or category of program.

Figure 1 illustrates the wide fluctuation of exploration expenditures over the past decade. The peak year 1988, *with expenditures of $230 million, coincided with the* height of flow-though funding. The past five years have shown a steady decline. For the same ten-year period, the pattern of exploration spending is similar to changes in the total value of solid mineral production (Figure 2).

Exploration targets are varied and include: veins, volcanogenic and sedimentary exhalative massive sulphides, porphyries, transitionals (porphyry to epithermal), coal, industrial minerals, skarns and diamonds (Figure 3a).

Approximately 18% of exploration expenditures were at minesites and 28% on 'advanced' projects, including environmental studies and reclamation programs (Figure 3b). In total, there were approximately 100 projects with budgets in excess of $100 000. Figure 4 shows the range of expenditures in excess of this figure. By far the largest program in the province was by Lac Minerals Limited on the **Red Mountain** property near Stewart, estimated at $10 million. Grassroots programs were carried out in the Babine area for porphyries, in southeastern and northeastern parts of the province for sedex deposits, in the Interior Plateau region of south-central British Columbia for gold, in the Stewart Camp in the northwest for gold, and in the Rocky Mountains for diamonds.

Similar trends are apparent in the levels of new mineral titles recorded (Figure 5) and in the number of Free Miner Certificates issued to companies and individuals operating in the province (Figure 6). Many of the claims staked are

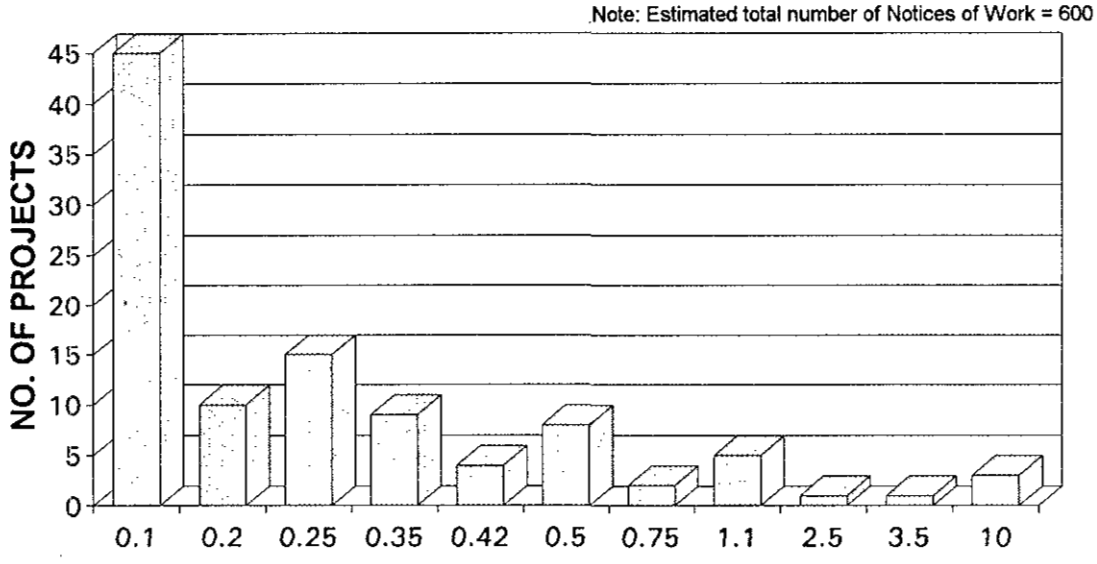
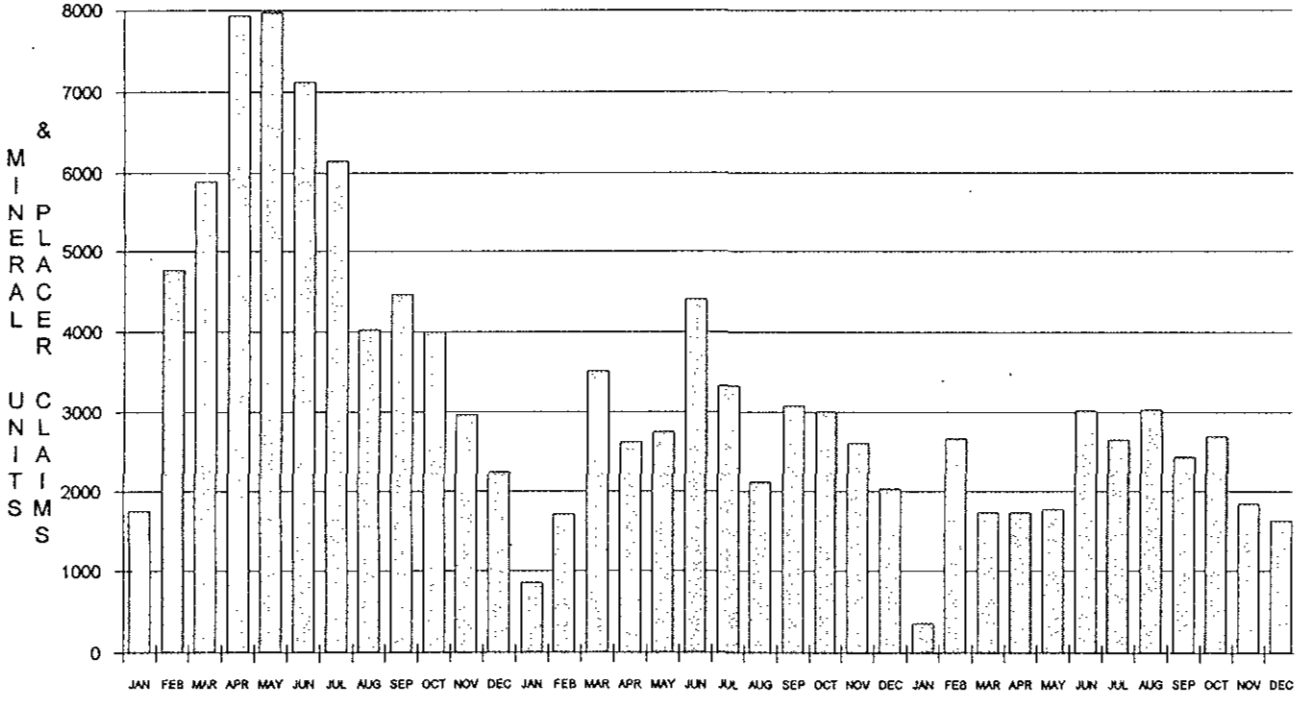


Figure 4. Estimated number of major projects (>$100 000).



Source: MEMPR, Mineral Titles Branch

Figure 5. All mineral tenure recorded by month; January 1991 to December 1993.

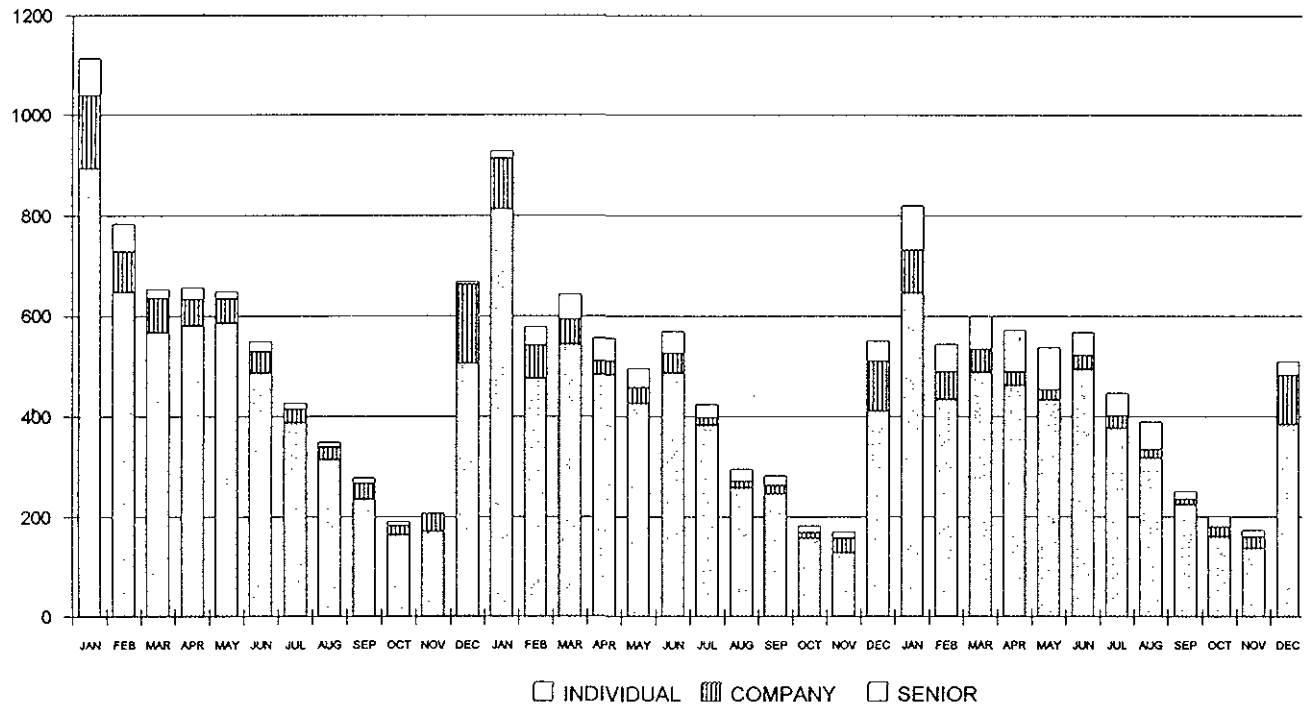


Figure 6. Free miner certificates recorded by type and by month; January 1991 to December 1993.

over previously forfeited claims with documented mineral showings. However, the low level of grassroots exploration implies that fewer new prospects are being discovered.

HIGHLIGHTS AT OPERATING MINES

PRODUCTION LEVELS

The locations of operating mines in British Columbia are shown on Figure 7. No new mines were opened in 1993. Seven operations were closed down, either permanently or indefinitely, due to exhausted ore reserves, or low metal prices (*see* Operations). However, some small high-grade projects (*i.e.,* **Elk, Skinner, Tillicum**) have continued to produce, or plan to produce, using custom milling arrangements (Table 1; *see* Operations). The **Johnny Mountain** gold-silver mine re-opened on a limited basis.

The estimated value of solid mineral production for 1993 in British Columbia is $2.28 billion (Table 2). Copper, at a projected value of approximately $701 million, represents nearly 31% of total mine production.

Coal represents 34% of the total value of production. Although output was marginally higher in 1993, total value is estimated at $784 million.

The production of gold is estimated at 14.2 million grams (441 700 ounces) valued at $211.7 million, down from 16.4 million grams (510 000 ounces) last year. Significant decreases were recorded from the Myra Falls and Equity Silver operations. Silver output is estimated at 170 million grams (5.29 million ounces) valued at $30.3 million, down significantly (*i.e.*, 40%) due to reduced production at the Equity Silver and Myra Falls operations. Zinc production in 1993 is estimated at 80 million kilograms worth $102 million; lead output is estimated at 43 million kilograms valued at $22.4 million. British Columbia coal and solid minerals account for about 25% of all Canadian exports to Pacific Rim markets.

OPERATIONS

METAL MINES

The **Snip** gold mine, owned and operated by Cominco Ltd. (60%) and Prime Resources Ltd. (40%), produced 4.65 million grams (149 700 ounces) of gold from 170 930 tonnes of ore milled, almost identical to that produced in 1992. Cash production costs in 1993 rose 5% from 1992 to US $152 per ounce. Snip has exceeded its planned production rates since start-up in 1991, the daily throughput during 1993 averaging 468 tonnes per day. Ore grade was slightly higher than the reserve grade of 28.5 grams per tonne gold. Metallurgical recovery for gold increased to 91.7%. Ongoing underground drilling on the Twin vein continued to replenish ore reserves and advance the inferred resource category to proven and probable reserves. Snip is by far the largest producer of gold in the province.

At the **Highland Valley Copper** mine, a partnership among Cominco Ltd. (50%), Rio Algom Limited (33.6%), Teck Corporation (13.9%) and Highmont Mining Company (2.5%), 1993 operations resulted in the production of concentrate containing 156 700 tonnes of copper, 1 700 000 kilograms of molybdenum, 398 100 grams of gold and 59 100 grams of silver. Mining was carried out in both the Valley and Lornex pits, with 87% of the ore coming from the former. The mill processed 44 473 000 tonnes during 1993, achieving an average daily throughput of 121 800 tonnes, one of the largest operatins in the world. Recovery of copper was 87.3%. Reserves a the end of 1993 were estimated at 627 000 000 tonnes grading 0.426% copper, and 0.0072% molybdenum.

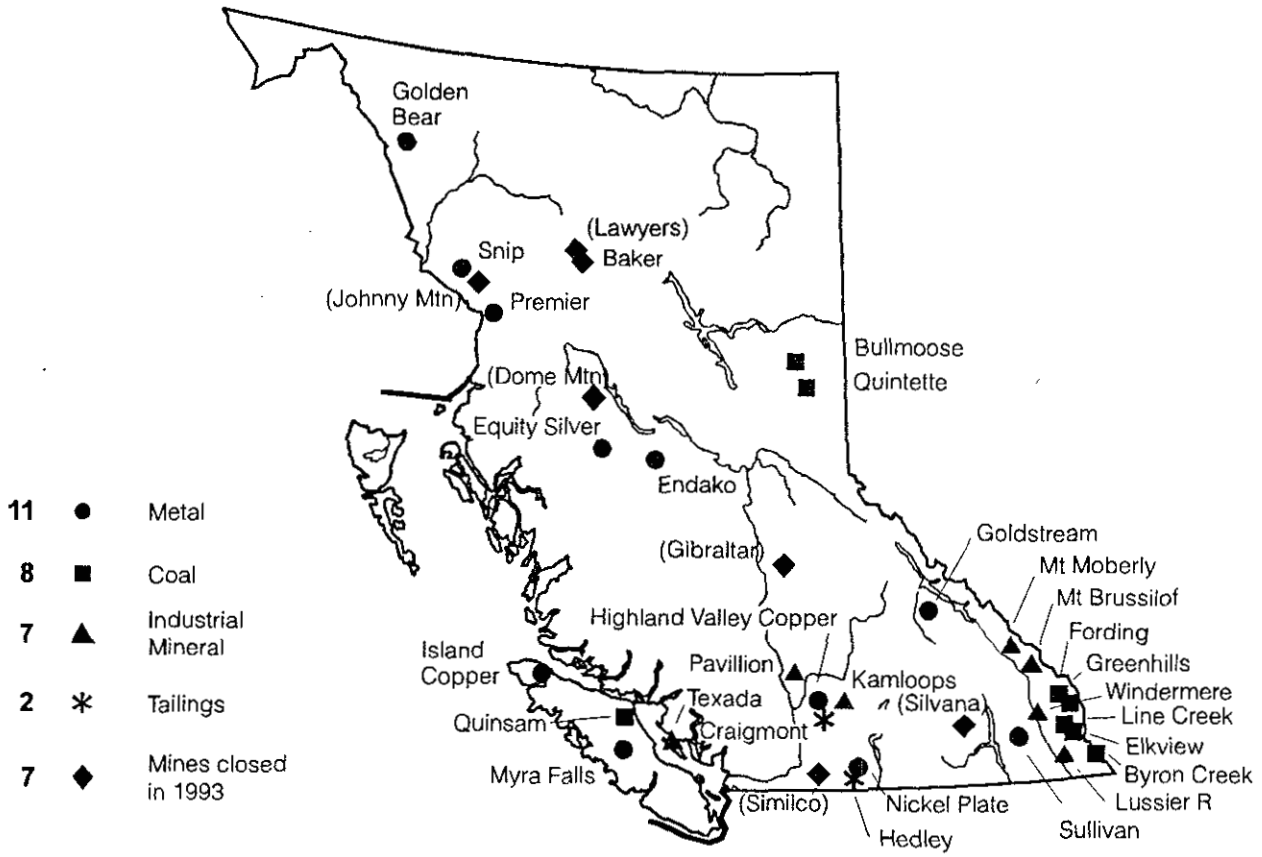


Figure 7. Operating mines in B.C. - 1993.

TABLE 1
CUSTOM MILLING PROJECTS

Mill Smelter	Project Name Potential	Commodity	Tonnes Milled	Metals Recovered
Horne/Helena	Elk	Au	3850	404 kg Au
Premier	Skinner	Au	29	3 kg Au, 1 kg Ag
Premier	Debbie	Au		
Goldstream	Tillicum	Au	5505	102.4 kg Au, 164 kg Au
Premier	Silver Butte	Au	2650	7.9 kg Au
Premier	Greens Creek	Au,Cu,Ag,Pb,Zn		
Premier	Johnson River	Au,Cu,Ag,Pb,Zn		
?	Brett	Au,Ag		
Island Copper	Red Dog	Cu,Au,Mo		
Island Copper	Hushamu	Cu,Au,Mo		
Premier ?	Red Mtn.	Au,Ag		
Equity Silver	Dome Mtn.	Au,Ag		
Standard	Iron Colt	Au		

TABLE 2
1993 ESTIMATED VALUE OF MINERAL PRODUCTION
IN BRITISH COLUMBIA

Commodity	Quantity (millions)	$ Value (millions)	Per cent of Total Value
Copper	285 kg	701	31
Gold	14.2 g	212	9
Zinc	81 kg	102	4
Lead	43 kg	22	1
Molybdenum	10 kg	58	3
Silver	170 g	30	1
Other		5	
Total Metals		**1130**	**49**
Structural Materials		320	14
Industrial Minerals		48	2
Metallurgical Coal	17 t	731	32
Thermal Coal	2 t	53	2
Total Solid Minerals		**2282**	**99**

Source: MEMPR, Land Management and Policy Branch

The Island Copper mine produced 58 million kilograms of copper, 1.3 million kilograms of molybdenum, 1.8 million grams (58 615 ounces) of gold and 16 million grams (516 383 ounces) of silver in 1993. Daily throughput averaged 51 084 tonnes at a head grade of 0.35% copper. The mine, in production since 1971, is expected to cease operations in late 1996. In 1993 BHP Minerals Canada introduced a proposal to convert the mined-out open pit into a garbage disposal site for such cities as Vancouver and Victoria, British Columbia and Seattle-Tacoma, Washington. BHP continued to conduct exploration in the general area, and other nearby copper properties (*e.g.,* Hushamu and Red Dog) are being re-examined by other companies with a view to development using the existing infrastructure at the Island Copper mine.

Production at the Westmin Resources Limited **Myra Falls** mine was affected by a labour dispute (since April 24) and low copper and zinc prices. Prior to the dispute, the Lynx mine was to be put on a care and maintenance basis. Production in 1993 totalled 6.8 million kilograms of copper, 269 000 grams (8400 ounces) of gold, 5555 kilograms (173 00 ounces) of silver, and 7900 tonnes of zinc from 433 410 tonnes of ore milled. Total proven and geological reserves as of January 1, 1993 were 12 516 000 tonnes grading 2.1 grams per tonne gold, 45.6 grams per tonne silver, 1.9% copper, 0.5% lead and 6.3% zinc. A further 2 706 000 tonnes were identified in the possible geological reserves category. Delineation drilling on the Battle/Gap area has yielded several significant intersections, particularly in the area northwest of the Gap zone and north of the North Down Drop fault. The exploration potential of the northern part of the property is now considerably enhanced. Exploration is continuing at the Battle zone in preparation for mining. Drilling continues to delineate the zinc-rich Top zone and the gold-rich South Trough zone, and confirms the high grade of the mineralization.

A new collective agreement may assist **Gibraltar Mines Ltd.** to proceed with a $35 million expansion plan. The plan calls for increasing the milling capacity to 51 700 tonnes from 34 500 tonnes per day and cash costs to be lowered by an estimated US 7-8¢ per pound of copper. During the summer, new short-term heap-leach pads were built to treat oxidized ore The molybdenum circuit was closed in December, 1992 and did not operate in 1993. Mining and milling operations were temporarily suspended from July 23 to August 25 to allow for $ 4.9 million in expenditures on development of Stage 3 of the Gibraltar East pit and for general maintenance. The company proceeded with solvent extraction electrowinning.

In 1996, which would be the first full year of expanded operation, production of copper in concentrates is expected to show an increase of 49% over 1992. In 1993 production totalled 23 million kilograms of copper in concentrate from 101 million tonnes of ore with an average grade of 0.30% copper. The average daily throughput was 38 910 tonnes; recovery of copper was 75.1%. Gibraltar's ore reserves are estimated at 147 478 200 tonnes grading 0.301% copper and 0.0084% molybdenum. These do not include the North Gib deposit which has a higher grade of copper estimated to be 0.4%. Mining and milling operations were again sus-

pended on December 1st due to continued low copper prices. In March, 1994 Gibraltar Mines entered into an option agreement with Imperial Metals Corp. on the Mount Polley copper-gold project, located 40 kilometres to the east of the Gibraltar mine. A feasibility study will be completed by later in the year.

At the **Equity Silver** mine, formerly an open-pit operation, mining was carried out underground on the North zone at a rate of 1180 tonnes per day. Production in 1993 totalled 2000 kilograms of copper, 508 kilograms of gold and 50 300 kilograms of silver from 422 000 tonnes of ore milled. The head grades were 0.58% copper, 2.9 grams per tonne gold, and 145 grams per tonne silver; the respective recoveries were 86.7%, 42.7% and 80.7%. The open pit and underground ore reserves were fully depleted by the end of January 1994. In the last month of operations, 51 700 tonnes were mined and milled and 108 960 kilograms of copper, 40.4 kilograms of gold and 2240 kilograms of silver were produced. Ongoing reclamation work, particularly the reclaiming of waste dumps, continues to provide better than expected results and at lower than expected costs.

In 1993 the Homestake Canada Ltd. **Nickel Plate** mine produced 2.3 million grams (73 908 ounces) of gold and 855 kilograms (27 480 ounces) of silver from 1 280 724 tonnes of ore at a milling rate of 3508 tonnes per day. Reserves at the end of 1993 were stimated at 4 375 000 tonnes grading 2.64 grams per tonne gold. Production is planned to 1997.

Cominco Ltd. production at the **Sullivan mine** in 1993 was 28 million grams (900 000 ounces) of silver, 4200 kilograms of lead and 8700 kilograms of zinc from 1 364 300 tonnes of ore milled at a daily rate of 7000 tonnes.

Gold production from the **Golden Bear** mine in 1993 was 1.6 million grams (52 357 ounces) at a cash cost of approximately US$240 per ounce. In April 1993, after completing a negative feasibility study on an expansion of the open pit, Homestake Mining Ltd. relinquished its interest in the mine to Wheaton River Minerals Limited by selling its 85% interest in North American Metals Ltd. Stockpiled ore from 1992 operations was milled during 1993 and Wheaton River Minerals is developing the Bear Main orebody with sublevels at 10-metre intervals and long-hole stoping began in October 1993. Reserves on January 1, 1994 on the Main Bear and the Bear North deposits were 94 000 tonnes grading 15.4, grams per tonne gold, together with a low-grade zone containing 105 210 tonnes grading, 8.2 grams per tonne gold. Other reserve areas include the Bear South and Fleece Bowl zones. Earlier exploration on the latter has indicated a resource of 110 650 tonnes grading 16.5 grams per tonne gold. Based on current reserves in the Bear Main zone, estimated at about 165 000 tonnes grading between 20 and 23 grams per tonne gold, and a milling rate of 400 tonnes per day, the mill has sufficient feed to last into late 1994. A $350 000 exploration program was commenced in September. Trenching and limited follow-up diamond drilling have located two 'new' zones: the Kodiak, along strike and about 2 kilometres north of the mine site, and the Grizzly (ex-Bear South zone), below the Bear Main zone, with a projected resource of some 45 350 tonnes. In January 1994 a ramp was collared near the millsite as part of a $2.2 million program to explore and develop the Grizzly deposit, with production forecast in late 1994. During October and November an 11-hole drilling program encountered significant gold mineralization in the Kodiak zone. Metallurgical testing indicates Kodiak mineralization is non-refractory and in-house testing indicates that it can be either, heap or vat-leached. In January 1994 a $1.44 million drill program began to further explore the structure. A two-phase winter drilling program is scheduled to further test these zones.

During 1993 the Similco Mines Ltd. **Similco** operation produced 23 580 kilograms of copper, 441 kilograms (14 181 ounces) of gold and 11 512 kilograms (370 130 ounces) of silver from 6 727 000 tonnes of ore at a daily milling rate of 22 700 tonnes. Reserves at January 1, 1994 stood at approximately 94.8 million tonnes grading 0.399% copper with additional values in gold and silver. Production over the winter was significantly less than expected due to severe weather which interrupted mining and ore delivery. Falling copper prices also contributed to losses. During 1993 Similco conducted a modest exploration program designed to locate new low-cost reserves on its property, but by year end it announced the closure of its operations.

During 1993 the Westmin Resources Limited **Premier** gold mine ran at 25% capacity on underground ore and some remaining stockpiled open-pit ore. In 1993, 657 kilograms (21 120 ounces) of gold and 4440 kilograms (142 700 ounces) of silver were produced from 159 521 tonnes of ore at a daily milling rate of 750 tonnes. Reserves at the end of 1993 were estimated at 230 200 tonnes grading 6.83 grams per tonne gold and 58.3 grams per tonne silver. The company continues to examine the option of custom milling ore from various sources including: Sulphurets (Brucejack); Chichagof, Greens Creek and Johnston River Alaska; Skinner, Red Mountain and Westmin's own Debbie property. An exploration program tested other showings on the property.

During 1993 the **Goldstream** mine, operated on a 50-50 basis by Goldnev Resources Inc. and Bethlehem Resources Corporation, produced 14.8 million kilograms of copper and 1.8 million kilograms of zinc from 425 130 tonnes of ore at a daily milling rate of 1300 tonnes. Reserves to the end of 1993 were estimated at approximately 1 million tonnes grading 4.31% copper, 12.94% zinc and 12 grams per tonne silver. Underground mining operations were suspended in May to allow time to revise mining plans to reduce costs in the light of decreasing copper prices, to decrease the environmental liability associated with the sur-

face stockpiles by milling them, and to allow for a smooth transition between underground mining contractors. Underground mining operations resumed in June using the revised mining plan. Bethlehem carried out a two-phase exploration program including diamond drilling to test targets based on re-interpretation of a previously flown airborne geophysical survey and recent discovery of mineralized float and outcrop in the area south of the mine. Bethlehem, in a joint venture agreement with Columbia Gold Mines Ltd., custom milled approximately 5500 tonnes of ore grading about 24.5 grams per tonne gold from the Tillicum property, at the Goldstream mill. Approximately 102 500 grams (3294 ounces) of gold and 164 kilograms (5275 ounces) of silver were recovered. Virtually all of the Tillicum gold blended into the Goldstream concentrate will constitute a credit which will accrue to the joint venture.

In the last half of 1993, International Skyline Gold Corporation completed rehabilitation and recommissioning of the **Johnny Mountain** gold mine. The concentrator treated 21 850 tonnes of ore at a daily milling rate of 350 tonnes prior to shut down for the winter. Production totalled 247 000 grams (7940 ounces) of gold, 481 kilograms (15 460 ounces) of silver, together with byproduct copper. Underground and surface exploration and development of reserves were concentrated on the Zephrin vein in the Stonehouse gold deposit and on recovery of remnant blocks of the 16 vein. The company went into the site last spring with 23 580 tonnes of ore identified. In addition, Skyline completed an induced polarization survey on the Bronson Creek (Red Bluff) porphyry copper-gold prospect located near the mine and follow-up diamond drilling consisting of seven holes was carried out.

At the **Endako** molybdenum mine, Placer Dome Inc. produced 6.6 million kilograms of molybdenum in 1993 from 9 579 400 tonnes of ore at a daily milling rate of 28 200 tonnes. Reserves as of January 1, 1994 were 128 205 000 tonnes grading 0.077% molybdenum.

In May 1993, the **Dome Mountain** gold mine was temporarily shut down to comply with the B.C. Ministry of Energy, Mines and Petroleum Resources' safety regulations, and because of continuing legal negotiations between Habsburg Resources Inc. and Timmins Nickel Inc. During 1992 the operation produced 313 056 grams (10 065 ounces) of gold and 1.6 kilograms (52 350 ounces) of silver from approximately 28 000 tonnes of ore via a custom milling agreement with Equity Silver Mines Ltd. Reserves at January 1, 1993 were estimated at 253 960 tonnes grading 11.3 grams per tonne gold. In August 1993, Habsburg reached agreement with Timmins Nickel to cease all legal action and restructure the Dome Mountain joint venture, giving Habsburg an 80% interest in the mine. Habsburg will be the operator and work began to develop a capital budget and new mine plan to enable resumption of production at a rate of 225 tonnes per day for an estimated 4-year mine life.

TAILINGS

During 1993 Candorado Mines Ltd. received a Mine Development Certificate for its **Hedley tailings** project for the reworking of an estimated 50 000 tonnes of old tailings from the historic Hedley (Nickel Plate) gold mine, over a 2-year period.

Craigmont Mines Ltd. and M-7 Industries Ltd. continued to recover magnetite from the stockpile remaining from past operations at the **Craigmont** mine. The product is shipped primarily to the coal industry in northeast and southeast British Columbia. Craigmont has received a Mine Development Certificate to treat the old tailings with the goal of processing 30 000 tonnes of magnetite per year.

COAL MINES

Coal production increased significantly from 1992 levels. In 1993 production of metallurgical and thermal coal amounted to 18 332 811 tonnes and 1 921 890 tonnes respectively, for a combined total of 20 254 701 tonnes. Coal quality attributes, such as low sulphur content and low ash basicity, make British Columbia coal attractive in global markets and will help maintain the province's position among world suppliers over the long term.

Increased confidence and interest in coal is exemplified by the large exploration programs carried out at three operating mines, as well as the renewed activities at the Telkwa and Tsolum Creek thermal coalfields.

In the Peace River coalfields, coal companies made productivity gains as they continue to operate as dedicated suppliers to the Japanese steel industry. The expiration of the first 15-year contract period in 1998 will undoubtedly see prices renegotiated. The **Bullmoose** mine of Teck Corporation (60.9%), Rio Algom Limited (29.1%) and Nissho Iwai Ltd. (10%) recently negotiated a new 4-year price agreement with the Japanese steel mills to supply metallurgical coal. Bullmoose has taken on the responsibility for 40 000 tonnes of coal per year of Quintette's delivery and the new increased production rate at Bullmoose is 2 million tonnes per year.

The **Quintette** mine of Quintette Coal Limited (a subsidiary of Teck Corporation) also supplies metallurgical coal to the Japanese steel industry, employing a workforce of approximately 1000. The operation is currently running very well with productivity and profits up. Estimated production in 1993 totalled 4.0 million tonnes.

In the East Kootenay coalfields, the dominant story is the rebound from the disastrous year in 1992. There have been successful start-ups at the two former Westar mines, Balmer (now called Elkview) and Greenhills, under new owners. Nevertheless, the production rate and size of the workforce are down substantially at both sites. Fording River, shut down for most of 1992 by a strike, was working at capacity in 1993.

At the **Fording River** mine, owned by Fording Coal Limited, the dragline was moved to its new location in the Henretta pit, north of the main operations area on Eagle Mountain. Production is at capacity of 6.5 million tonnes per year of predominantly metallurgical coal for Pacific Rim and other world markets, but also includes some thermal coal which is sold to various markets, including Ontario Hydro. The workforce is estimated at close to 1000. The mine has a healthy reserve. In 1993 Fording also carried out a large exploration program, which included deep drilling on that part of the property which adjoins the newly acquired Greenhills mine.

At the **Greenhills** mine 1993 production of both metallurgical and thermal coal for Pacific Rim and other overseas markets totalled approximately 1.9 million tonnes, about 45% of previous production. The company expects to mine 2.4 million tonnes in 1994.and reach full capacity of 3 million tonnes in 1995. Fording has electrified the pits and developed a new mining plan, based on larger scale equipment and merging of smaller pits into large ones. The workforce at present is about 350.

At the **Line Creek** mine, Line Creek Resources Ltd. (a subsidiary of Manalta Coal Ltd.) continued to produce both metallurgical and thermal coal for Pacific Rim and other overseas markets at a relatively consistent rate of 2.6 million tonnes per year, about 13% below capacity. Extensive exploration was conducted in 1993 to prove up new reserves within and close to its mining lease, with the main focus on Horseshoe Ridge which is on the other side of Line Creek and to the east of the main pit. The workforce is estimated at 450.

At the **Elkview** mine, new owner Elkview Coal Corporation (a subsidiary of Teck Corporation) has re-established markets for metallurgical coal in Japan and continued to pursue new markets. Planned production was 2.7 million tonnes in 1993.

At the **Byron Creek** mine, new owner Corbin Creek Resources Ltd. (owned by former Esso Resources Ltd. mine staff) currently sells some thermal coal to Line Creek. The mine has lost its main thermal coal contract with Ontario Hydro. Estimated production in 1993 was 0.7 million tonnes, well below capacity, and new overseas marketing efforts are underway for thermal coal and weak coking coal.

At the **Quinsam** mine on Vancouver Island, Hillsborough Resources Ltd. increased production with a further increase to 1.2 million tonnes planned by 1997. Quinsam coal is currently barged to a port facility on Texada Island for export to Japanese utilities and cement companies; however, Hillsborough has plans to build a port facility north of Campbell River. The company is also examining potential markets in the United States.

ADVANCED EXPLORATION AND DEVELOPMENT PROJECTS

A number of exploration projects have advanced to or are approaching the development stage. The projects described in this section are shown on Figure 8 and listed, with reserves, in Table 3.

The Eskay Creek project is now owned 100% by Prime Resources Group Inc. which is controlled by Homestake Canada Ltd. A feasibility study, released September 24, 1993, indicates proven and probable reserves for the 21B zone are 1.09 million tonnes grading 65.14 grams per tonne gold, 2949 grams per tonne silver, 5.6% zinc and 0.77% copper, for a total *in situ* resource of 71 000 kilograms (2 300 000 ounces) of gold and 3214 tonnes (103 000 000 ounces) of silver. Total costs of developing Eskay Creek are estimated at $75 million, including $36 million on construction planned for 1994. The cost of producing an ounce of gold is estimated at US$187. Early in 1994 Prime announced its decision to proceed with the development of the mine and sale of ore directly to smelters in Japan and Quebec. Prime expects to produce approximately 108 840 tonnes of ore per year containing 6530 kilograms (210 000 ounces) of gold and 292 million kilograms (9.4 million ounces) of silver. Byproduct zinc and copper production would be 5 400 tonnes and 800 tonnes, respectively.

In March 1994 a Mine Development Certificate was for the Eskay Creek project was granted. Road construction up Volcano Creek to the minesite has been completed and construction is planned for 1994. Commercial production could begin by late 1995 or early 1996. During the 1993 field season Homestake conducted a property-wide and regional exploration program, estimated to have cost $1 million, testing numerous zones of mineralization and refining the Eskay Creek stratigraphy.

In 1993 Lac Minerals Ltd. carried out the largest exploration program in the province, with expenditures estimated at $10 million on its Red Mountain project (Plate 1). In 1992 Lac reported reserves of 2 539 600 tonnes grading 12.8 grams per tonne gold and 38.1 grams per tonne silver at a cut-off grade of 3 grams per tonne gold for a resource in excess of 31 100 kilograms (1 million ounces) of gold in two zones. During 1993 the company completed a surface drilling program of 36 880 metres, together with 792 metres of underground development and 9144 metres of underground diamond drilling. Total exploration expenditures on the property to the end of 1993 are estimated at $15 million. In a news release dated September 24, 1993 Lac Minerals announced the discovery of two new zones which have added to the geological resource and indicate the potential for the delineation of more than 62 200 kilograms (2 million ounces) of gold. The new zones, the JW zone located below the AV zone and the 141 zone located southwest of the Marc zone, were identified by surface drilling. Gold grades and widths in these new zones are consistent with those already

encountered in the Marc and AV zones. Additional work on the metallurgical, engineering and environmental aspects of the project is continuing in advance of a feasibility study.

The Tulsequah Chief and Big Bull projects, located 75 kilometres northeast of Juneau, Alaska, were explored by Redfern Resources Ltd. with total expenditures estimated at $2.7 million. A pre-feasibility study on the Tulsequah Chief deposit determined that it can become a viable mine based on drill-indicated mineable reserves, with 18% dilution, estimated at 6.93 million tonnes grading 1.40% copper, 1.07% lead, 6.42% zinc, 2.40 grams per tonne gold and 93.37 grams per tonne silver. The proposed production rate is 2250 tonnes per day. Total capital investment, exclusive of permitting, is forecast at $138 million pre-production with an additional $27 million over the 9-year life of the mine. The 1993 underground program of fill-in and exploratory drilling, primarily on the main H lens, confirmed the tonnage estimates and increased the overall grade by an estimated 5 to 10%. The deposit remains open to depth. In addition, Redfern completed an extensive program of line-cutting and induced polarization surveys over several areas between the Big Bull and Tulsequah Chief sites. Two chargeability and resistivity anomalies coincident with mapped zones of intense alteration were drilled. At the Big Bull site, Redfern completed a two-phase drilling program consisting of eleven holes designed to test for mineralization at depth and along strike to the southeast. Definition of mineable reserves at Big Bull could add significantly to the viability of the Tulsequah Chief deposits.

On the Sulphurets (Bruceside) project, owned 60% by Newhawk Gold Mines Ltd. and 40% by Granduc Mines Ltd., more than 3300 metres of surface drilling were completed on the SG, Galena Hill, Shore, Gossan Hill and Maddux zones at an estimated cost of $1 million. Results have confirmed the orientation of ore-bearing structures and provided increased confidence in the zones which are all open along strike and down dip. An estimation of a total mineral inventory for all mineralized zones was completed in the spring of 1994. On April 14, 1993 the company received its Mine Development Certificate from the provincial government, based on reserves in the West zone totalling approximately 750 000 tonnes grading 15.4 grams per tonne gold and 678 grams per tonne silver.

During the 1960s and early 1970s several drilling programs were carried out on the Huckleberry porphyry copper-molybdenum prospect. In 1992 New Canamin Resources Ltd. completed an agreement with Kennecott Canada Inc. and carried out further drilling focused on the high-grade core within the Main zone. New Canamin arranged for engineering and reserve calculation studies and in January 1993 the company filed a pre-application prospectus with the Mine Development Assessment Process.

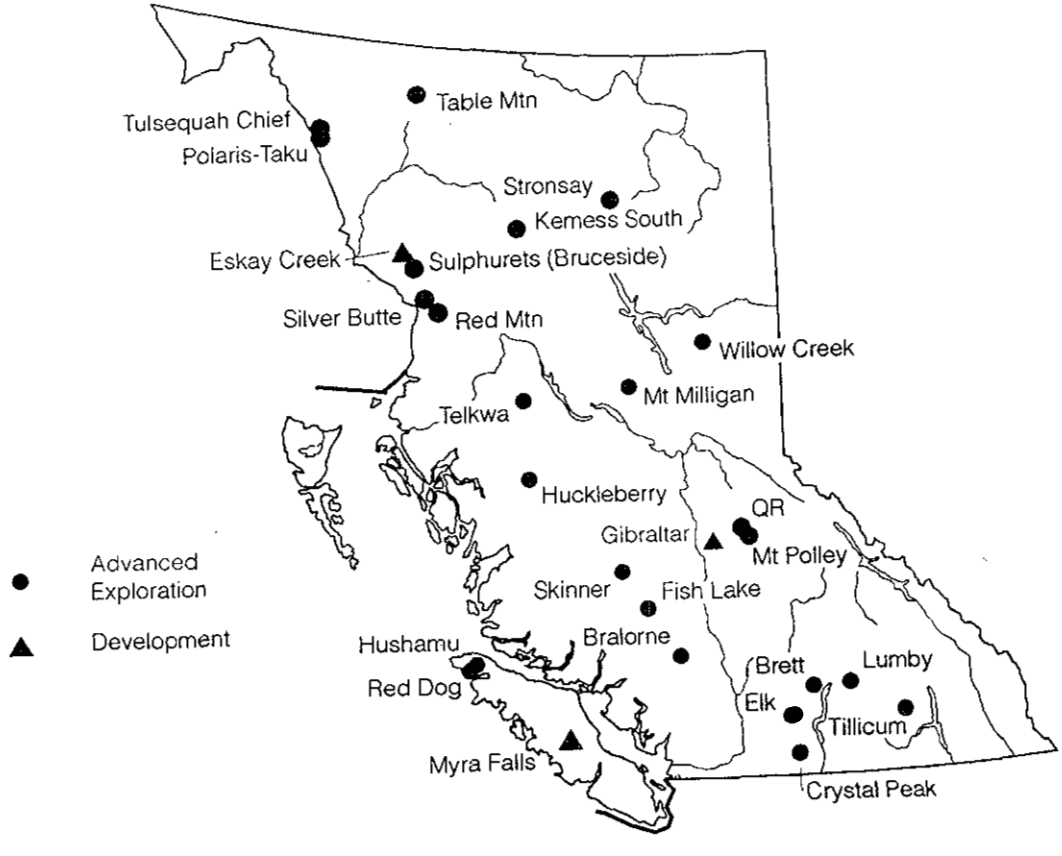


Figure 8. Advanced exploration and development projects in British Columbia.

TABLE 3
NEW MINES, CLOSURES, DEVELOPMENT AND ADVANCED EXPLORATION PROJECTS

Company Name	Project Name	Commodity	Estimated Tonnes (000s)	Estimated Grade	Reference	Estimated Employment
New Mines						
None						
Closures (Indefinite)						
Cheni Gold Mines Ltd	(Lawyers)	Au,Ag				45
Sable Res. (DuPont)	Baker	Au,Ag				20
Timmins Nickel Inc./ Habsburg Res. Inc.	(Dome Mtn.)	Au,Ag				50
Similco Mines Ltd.	(Similco)	Cu,Au				265
Gibraltor Mines Ltd.	(Gibraltor)	Cu				
International Skyline Gold Corp.	(Johnny Mountain)	Au,Ag,Cu				
Treminco Resources Ltd.	Silvana	Ag,Pb,Zn				
Development (Production Decision Announced)						
Westmin Res. Ltd.	Myra Falls/ Battle zone	Cu,Pb,Zn, Ag,Au	3000	2.9% Cu, 0.4% Pb, 14% Zn, 24 g/t Ag, 1.0 g/t Au	Westmin, Oct. 1992	459
Prime Res. Group Inc.	Eskay Creek/ 21B zone	Au,Ag	1000	65.14 g/t Au, 2949 g/t Ag, 5.6% Zn, 0.77% Cu	Homestake, Sept. 1993	250
Gibraltar Mines Ltd.	Gibraltar (Expansion)	Cu	147 500	0.3% Cu, 0.0084% Mo	Gibraltar, 1993	285
Advanced Exploration						
Coal and Industrial Mineral Deposits						
Manalta Coal Ltd.	Telkwa	coal	38 670	thermal		
Globaltex Industries Inc.	Willow Creek	coal		thermal		
Quinto Mining Corp.	Lumby Plateau shear zone	Au, graphite, sericite	500	4.5 g/t Au	Quinto, 1993	50
Polestar Expl. Ltd.	Crystal Peak	garnet	40 000	78% garnet	Polestar MDAP,1991	
Porphyry Deposits						
Imperial Metals Corp.	Mt. Polley	Cu,Au	49 000	0.38% Cu, 0.55 g/t Au	Imperial Metals MDAP,1992	200
Taseko Mines Ltd.	Fish Lake	Cu,Au	870 000	0.23% Cu, 0.43 g/t Au	Taseko Mines, 1993	300+
El Condor Res. Ltd./ St. Philips Res. Ltd.	Kemess South	Cu,Au	200 400	0.22% Cu, 0.63 g/t Au	El Condor, MDAP, 1992	300+
Jordex Res. Inc.	Hushamu (Expo)	Cu,Au,Mo	173 250	0.27% Cu, 0.34 g/t Au, 0.01% Mo	Jordex, 1992	
Crew Natural Res.	Red Dog	Cu,Au	31 200	0.313% Cu, 0.45 g/t Au, 0.007% Mo	Crew Natural Resources MDAP, 1992	
New Canamin Res. Ltd.	Huckleberry	Cu,Au				
	Main zone		31 000	0.52% Cu	New Canamin, 1993	
	East zone		69 000	0.572% Cu		

(Table 3 continued)

Company Name	Project Name	Commodity	Estimated Tonnes (000s)	Estimated Grade	Reference	Estimated Employment
Placer Dome Inc.	Mount Milligan	Cu,Au	298 400	0.22% Cu, 0.45 g/t Au	Placer Dome, 1992	
Massive Sulphide Deposits						
Teck Corp.; Cominco Ltd.;. Korea Zinc; Samsung	Stronsay (Cirque)	Pb,Zn,Ag	24 700	2.3% Pb, 8.5 % Zn, 50.8 g/t Ag	Curragh MDAP, 1991	300+
Redfern Res. Ltd.	Tulsequah Chief/ Big Bull	Cu,Pb,Zn, Au,Ag	6930	1.4% Cu, 1.07% Pb 6.42% Zn, 2.40 g/t Au, 93.37 g/t Ag	Redfern, 1993	
Skarn Deposits						
Kinross Gold Corp.	QR	Au	1300	4.7 g/t Au	Kinross, MDAP, 1993	
Transitional and Vein Deposits						
Bralorne-Pioneer Gold Mines Ltd./ Avino Mines and Res. Ltd.	Bralorne Above 1000 level Below 1000 level	Au,Ag	292 673	12 g/t Au 8.2 g/t Au	Avino MDAP, 1992	50
Liquid Gold Res. Inc./ Huntington Res. Ltd.	Brett Bonanza zone	Au	2.3	100 to 120 g/t Au	Huntington, 1993	
Cusac Industries Ltd.	Table Mountain West Bain vein East Bain vein	Au	31.5 20	23.6 g/t Au 19.4 g/t Au	Cusac, 1993	
Rembrandt Mines Ltd.	Polaris-Taku	Au	2200	14.7 g/t Au	Rembrandt, 1993	
Newhawk Gold Mines Ltd.	Sulphurets (Bruceside) West zone	Au,Ag	750	15.43 g/t Au, 647.2 g/t Ag	Newhawk MDAP, 1993	50 - 60
Fairfield Minerals Ltd.	Elk	Au	122.5	54.5 g/t Au, 24.68 g/t Ag	Fairfield, 1993	
Tenajon Res. Ltd./ Westmin Resources Ltd.	Silver Butte West Kansas zone	Au,Ag	?			
Lac Minerals Ltd.	Red Mountain	Au,Ag	2540	12.8 g/t Au 38.1 g/t Ag	Lac Minerals MDAP, 1993	
Westmin Res. Ltd./ White Hawk Ventures Inc.	Debbie, 900 Zone	Au				

The prospectus was based on an indicated reserve of 40 million tonnes of which 24 million tonnes in the core zone were estimated to grade greater than 0.60% copper and 16 million tonnes surrounding the high-grade core were estimated to grade greater than 0.40% copper. Definition drilling in 1993 outlined a total Main zone reserve of 31 million tonnes grading 0.52% copper. During drill testing of the proposed tailing impoundment area, the East zone was discovered, approximately 1200 metres east of the Main zone. As of October 1, 1993, 10 650 metres of diamond drilling on the East zone has identified a drill-indicated and inferred mineral inventory of 69 million tonnes grading 0.572% copper within which there is a higher grade core of 31 million tonnes grading 0.64% copper. New Canamin also completed an airborne geophysical survey which outlined several anomalies. An aggressive exploration program is planned for 1994 and will include a prospectus for mine development, a feasibility study and an application for a Mine Development Certificate.

In August 1993 Taseko Mines Limited filed a pre-application for a Mine Development Certificate for its Fish Lake porphyry copper-gold project. Systematic diamond drilling of 68 000 metres on 100-metre centres in 1991 and 1992 has outlined a mineral inventory of 1279 million tonnes grading 0.22% copper and 0.42 gram per tonne gold, at a cut-off of 0.30% copper equivalent. Preliminary mineable reserve estimates range up to 870 million tonnes grading 0.23% copper and 0.43 gram per tonne gold. A proposed

initial milling rate of 54 400 tonnes per day could produce an average of 43 630 tonnes of copper and 7120 kilograms of gold per year. Detailed mine planning and pre-feasibility studies were completed in early 1994.

At the Kemess South project, El Condor Resources Ltd. (60%) and St. Philips Resources Inc. (40%) completed a detailed pre-feasibility study in 1993. A prospectus was filed with the provincial government in March 1992. Mineable reserves are estimated at 200 440 000 tonnes of hypogene and supergene ore at an average grade of 0.22% copper and 0.63 gram per tonne gold. At a proposed daily milling rate of 40 000 tonnes, the company forecasts the average annual production would be 6625 kilograms gold, 25.9 million kilograms of copper and 5288 kilograms of silver. Capital costs for the mine are estimated at $374 million. An application for a Mine Development Certificate was submitted to the provincial government in early 1994, with production planned for late 1996.

Placer Dome Inc. continued to evaluate the viability of its large Mount Milligan porphyry copper-gold property with reserves estimated at 298.4 million tonnes grading 0.22% copper and 0.45 gram per tonne gold. The company estimates the deposit contains recoverable resources of 544 million kilograms of copper and 93 300 kilograms of gold. Pre-feasibility studies, based on an average milling rate of 68 900 tonnes per day, indicate annual production would average 45.4 million kilograms of copper and 7776 kilograms of gold. Capital costs were projected in the $500 to $600 million range. A combined Mine Development and Energy Project Certificate was issued to Placer Dome in late November.

Imperial Metals Corporation continued to seek financing to develop its Mount Polley porphyry copper-gold property with reserves estimated at 49 million tonnes grading 0.38% copper and 0.55 gram per tonne gold. At a daily milling rate of 13 700 tonnes the annual output is forecast to be 13.6 million kilograms of copper and 3100 kilograms of gold. Capital costs are estimated at $150 million. A Mine Development Certificate was issued in October 1992.

In a restructuring program CMP Resources Ltd. merged with affiliated companies, leaving the QR gold project in the hands of Kinross Gold Corporation. In February 1994, Kinross Gold Corp. received approval for an amendment to the Mine Development Certificate. Total reserves in three separate and widely spaced zones are estimated at 1.3 million tonnes grading 4.7 grams per tonne gold. Output at a daily milling rate of 800 tonnes is projected at 1.2 million grams of gold per year at a cash operating cost of about US$220 per ounce.

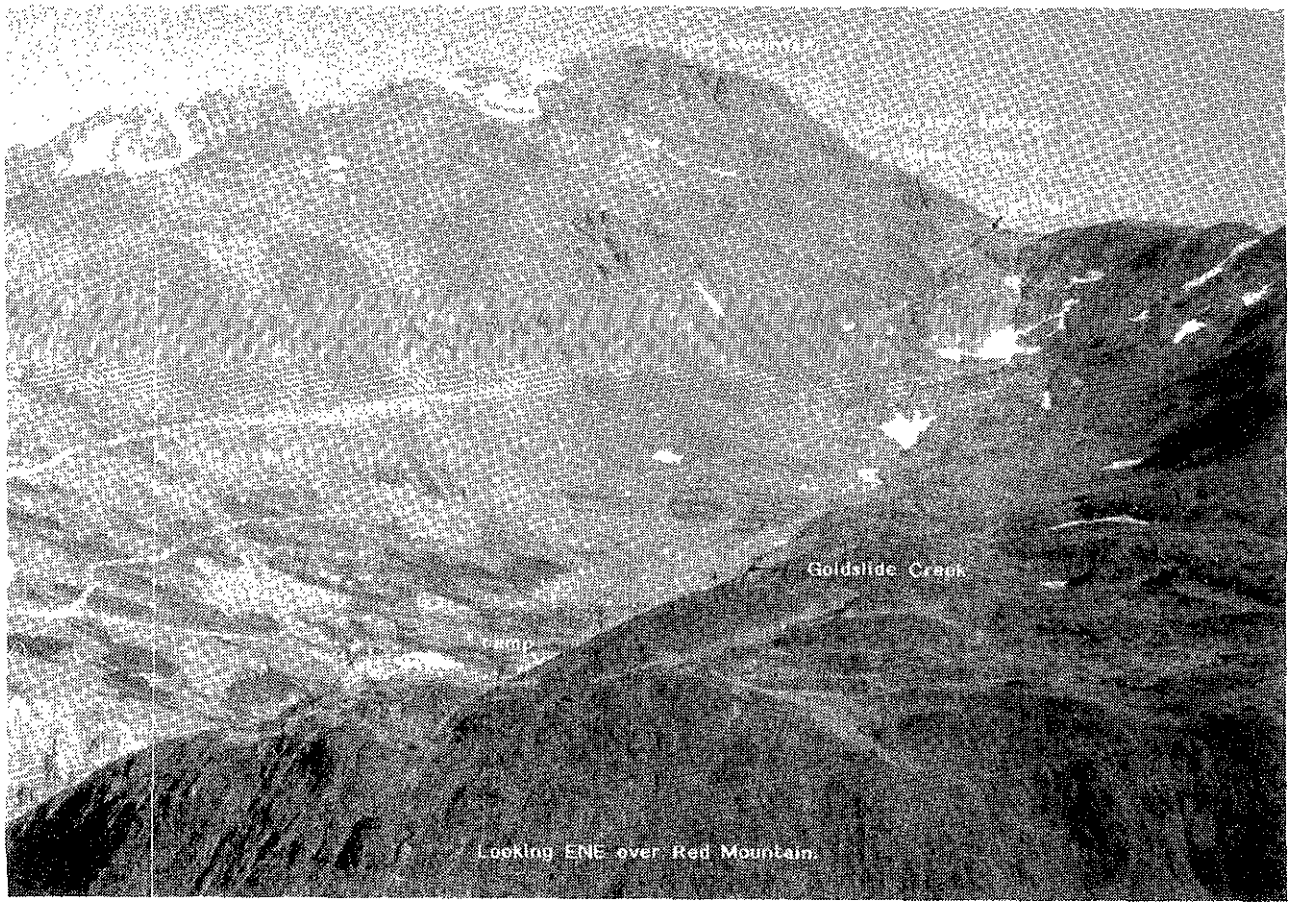


Plate 1. Looking northeasterly towards Red Mountain.

The Polaris-Taku gold project lies directly across the Tulsequah River from the Tulsequah Chief site. At the end of 1992 possible geological reserves in three major vein systems were estimated at 2.2 million tonnes grading 14.7 grams per tonne gold. All three systems remain open to depth and along strike. A diamond drilling program was carried out in the spring. Rembrandt Gold Mines Ltd., which now has 100% control of the property, is pursuing development options.

In December 1992, Curragh Inc. was issued a Mine Development Certificate for its Stronsay (Cirque) lead-zinc-silver project. At a daily milling rate of 3500 tonnes the company estimated that the project would produce about 250 000 tonnes of zinc and lead sulphide concentrates yearly. Reserves in the North orebody are estimated at 24.7 million tonnes grading 2.3% lead, 8.5% zinc and 50.8 grams per tonne silver. Capital costs are estimated at $130 million for on-site development and construction, plus $37 million for off-site infrastructure and facilities. Teck Corporation, Cominco Ltd., Korea Zinc and Samsung acquired the Cirque property in early 1994. The two Canadian companies will each own 25% and the two Korean companies a combined total of 50%.

Jordex Resources Ltd. completed a pre-feasibility study on its Hushamu (Expo) porphyry copper-gold project located approximately 20 kilometres west of the Island Copper mine, based on proven and probable reserves of 173 237 000 tonnes grading 0.27% copper, 0.009% molybdenum and 0.34 gram per tonne gold. The company estimates projected annual production at a daily milling rate of 50 000 tonnes in the Island Copper concentrator would be 45.5 million kilograms of copper, 3900 kilograms of gold and 1 million kilograms of molybdenum. Various methods of transporting the ore to the Island Copper mill are being investigated, including a conveyor system.

A prospectus on the Crew Natural Resources Ltd. Red Dog porphyry copper-gold property, located approximately 35 kilometres west of the Island Copper mine, was submitted to the Mine Development Assessment Process in April 1992. Geological reserves are estimated at 31.2 million tonnes grading 0.313% copper, 0.45 gram per tonne gold, and 0.007% molybdenum, based on a cut-off grade of 0.2% copper. In March 1993, Crew Natural Resources made a formal proposal to BHP (Canada) Ltd. regarding the custom milling and beneficiation of ore at the Island Copper operation. In March 1994, Crew Natural Resources Ltd. announced it was terminating its interest held under the 1988 option agreement.

Bralorne-Pioneer Gold Mines Ltd., in a joint venture with Avino Mines and Resources Ltd., conducted a trenching and surface drilling program designed to locate extensions and prove reserves in the Peter and Milchuk vein systems on the Bralorne mine (King mine) property. In 1992 Avino filed a prospectus with the provincial government based on proven and possible reserves of 292 000 tonnes grading 12 grams per tonne gold in the Bralorne mine above the 1000 level. Additional reserves below the 1000 level are estimated at 673 000 tonnes grading 8.2 grams per tonne gold. Also, two veins on the Loco prospect are estimated to contain 362 800 tonnes grading 17.2 grams per tonne gold.

Cusac Industries Ltd. secured financing to place the Table Mountain gold mine back in production. Cusac bought the property from Energold Minerals Inc. earlier in 1993. Reserves are estimated at 31 510 tonnes grading 23.6 grams per tonne gold for the West Bain vein and 20 060 tonnes grading 19.4 grams per tonne gold for the East Bain vein. A modern, 275 tonne per day flotation and gravity concentrator is on the property. The capital cost estimated to develop the reserves is $3.8 million. The camp was winterized and a 215-metre decline to the West Bain vein was completed in early 1994. Table Mountain is expected to produce at least 715 kilograms (23 000 ounces) of gold at a cost of less than US$200 per ounce in 1994. Milling began in the spring of 1994 with cash production costs estimated at US$160 per ounce of gold. The company also plans to dewater the decline at the old Cusac mine to test a preliminary reserve of 22 675 tonnes grading in the order of 34 grams per tonne gold.

Underground exploration continued on the Tenajon Resources Corporation and Westmin Resources Limited West Kansas zones on the SB (Silver Butte) gold project in the Stewart area. Bulk sampling for test milling was conducted at Westmin's adjacent Premier mill. A total of 50 metres of strike length of the West Kansas zone was explored by sub-drifting and diamond drilling. The reserves calculated for this strike length are 312 700 tonnes grading 3.07 grams per tonne gold. Results from the mill runs averaged 3.25 grams per tonne gold and 30.82 grams per tonne silver, and yielded 8000 grams (257 ounces) of gold from 2647 tonnes. Gold recoveries averaged more than 92%. The West Kansas zone is open at depth and along strike. Follow-up work is planned. Underground development and definition diamond-drilling will continue, in an effort to define the underground bulk-tonnage potential.

Huntington Resources Ltd. (50%) and Liquid Gold Resources Inc. (50%) conducted a two-phase exploration program including reverse circulation drilling totalling 725 metres, designed to test the grade and structure along the Main zone shear and RW vein to establish open-pit reserves on their Brett gold property. The Bonanza zone in the Main zone shear is estimated to contain some 2270 tonnes grading 100 to 120 grams per tonne gold. The Main vein has been traced over a 1.5-kilometre strike length. Drilling will also test the vein down dip to expand underground ore reserves. The RW vein has been exposed over a length of 210 metres. The trenching and reverse circulation drilling in the high-grade section of the RW vein trench has indicated a

resource in the range of 725 tonnes grading 41.1 grams per tonne gold of underground exploitable vein material. Underground development on the high-grade Bonanza zone is planned for 1994.

During 1993 a 210-tonne bulk sample of high-grade material mined underground, by Fairfield Minerals Ltd. on the Siwash North vein on the Elk property yielded 404 kilograms (13 000 ounces) of gold and 498 kilograms (16 000 ounces) of silver from 3850 tonnes of ore treated at the Helena, Montana smelter. The continuity and high grade of the vein were confirmed. Mining costs are projected to be less than US$170 per ounce gold. A 410-metre decline was driven at 15% gradient and subdrifts totalling 90 metres opened up the vein on two levels, 76 and 106 metres down dip from the open pit. In January 1994, Fairfield bought back a 10% net proceeds royality from Placer Dome Inc. Programs budgeted at $5.0 million in 1994 include open pit production and underground exploration. These are expected to produce 777 600 grams (25 000 ounces) of gold from approximately 9000 tonnes of high-grade ore. The deposit remains open at depth.

Bethlehem Resources Corporation and Goldnev Resources Inc., in agreement with Columbia Gold Mines Ltd., together mined a 5500-tonne bulk sample from the high-grade Heino-Money zone on the Tillicum property. The ore was processed at the Goldstream concentrator, yielding 102 kilograms (3294 ounces) of gold and 164 kilograms (5275 ounces) of silver in concentrates which were shipped to Japan for smelting. The tonnage produced was less than expected as the ore was erratic and pinched out. Exploration drilling and drifting in the zone did not add to the reserves. The option was terminated; Columbia Gold Mines Ltd. is proceeding with negotiations for disposition of its interest in the Tillicum property.

Ottarasko Mines Ltd. mined A 172-tonne bulk sample mined from an open cut by from the Victoria vein on the Skinner gold property in 1992 and 1993 has yielded a total of 11 353 grams (365 ounces) of gold for a recovered grade of 65.83 grams per tonne gold. The ore was processed at Westmin Resources Limited's Premier mill near Stewart. Total costs were estimated at US$197 per ounce gold. In the spring of 1994 Cheni Gold Mines Inc. optioned the property and plans an intensive underground sampling and surface diamond-drilling program.

The Crystal Peak high-grade garnet project, operated by Polestar Exploration Ltd., remains in the Mine Development Assessment Process with land-use and First Nations' concerns still to be resolved.

Quinto Mining Corporation conducted exploration and bulk sampling on its Lumby (Chaput) gold and graphite-sericite property. The end product graphite and sericite, is being tested as a filler for plastics and composite materials. A drill-indicated reserve is estimated at 507 920 tonnes grading 4.5 grams per tonne gold using a cut-off grade of 2 grams per tonne; there was no estimate of the value of the graphite and sericite. Laboratory tests performed on a 700-kilogram bulk sample indicated that over 300 kilograms of industrial mineral products could be recovered from a tonne of ore. Underground development work is continuing. The company has acquired a complete composite material research and testing laboratory in Lumby to allow for processing and testing on a daily basis.

COAL EXPLORATION

1993 saw an increase in coal exploration in four areas in the province (Table 4): the Kootenays, Telkwa, Peace River and Vancouver Island. Greater interest is being shown in thermal coal properties located near tidewater (Tsolum River) or existing railways (Telkwa and Willow Creek.)

In the Kootenay coalfields of southeastern British Columbia, Fording Coal Limited conducted exploration programs at its Fording River and Greenhills operations. In the exploration and development program, a total of 46 holes were drilled for coal sampling and down-hole geophysics, and 25 pits were excavated for coal and geotechnical tests. Now that Fording has acquired the

TABLE 4
COAL EXPLORATION

PROPERTY	OPERATOR	COAL TYPE	EXPLORATION WORK				
			D.D.H.	R.D.H.	Total Depth (m)	Trenches (m)	Test Pits
Fording River	Fording Coal Ltd.	Metallurgical	-	17	5325	-	13
Greenhills	Fording Coal Ltd.	Metallurgical	-	29	4650	-	12
Line Creek	Manalta Coal Ltd.	Metallurgical	-	150	23 800	6x120	-
Horseshoe Ridge	Manalta Coal Ltd.	Metallurgical	11	65	12 000	10x300	2
Saddle	Manalta Coal Ltd.	Metallurgical	1	12	3100	-	-
Telkwa	Manalta Coal Ltd.	Thermal	27	68	8500	5x25	-
Willow Creek	GlobalTex Mining Corp.	Thermal	-	-	-	-	11
Tsolum River	Canadian Occidental Petroleum Ltd.	Thermal	296	5	3201	-	-

Greenhills property, previously owned by Westar Mining Ltd., the former buffer zone of some 5 square kilometres will become a prime exploration target. On the Line Creek and adjacent properties, Manalta Coal Ltd. drilled 12 diamond-drill holes, 227 rotary-drill holes and excavated two test pits on its coal licenses and leases. No exploration work was done on the Elkview property, recently acquired by Teck Corporation. The total of work done in the Kootenays amounted to 12 diamond-drill holes and 273 rotary-drill holes with a total depth of 48 875 metres, and 27 test pits. The total exploration expenditure amounted to about $1.75 million.

Intensive exploration on the Telkwa property started up again in 1992 when it was acquired by Manalta Coal Ltd. The licenses are located near Smithers in west-central British Columbia and cover the largest thermal coal deposit in the province located near a rail line with easy access to ocean shipping. The program for the current year included 27 diamond-drill holes and 68 rotary-drill holes with a total depth of 8500 metres, and five trenches. Down-hole and ground geophysical surveys were conducted. In 1993 Manalta Coal Ltd. conducted a $700 000 exploration program on its Telkwa coal project designed to follow up its 1992 discovery in the Tenas Creek area, to explore the area east of Pit 7 reserves, to extend the limits of Pit 8 reserves, to conduct infill drilling on Pit 3 reserves, and to carry out geophysical surveys and drilling on proposed plant and tailings disposal sites. Geological reserves of thermal coal are estimated to be 38.7 million tonnes. The application to the Mine Development Assessment Process, originally filed in 1990, has been re-activated for review.

In the Peace River area in northeastern British Columbia, GlobalTex Mining Corporation excavated 11 test pits for coal bulk sampling, covering three coal licenses on the Willow Creek property. The total exploration expenditure did not exceed $50 000. In 1983, the property had reached Stage II in the assessment review process. There was no exploration at either Quintette or Bullmoose.

On Vancouver Island, Canadian Occidental Petroleum Ltd. continued exploration on its Tsolum River property which it acquired five years ago. It is located 10 kilometres southeast of Campbell River. A total of 296 diamond-drill holes were completed. The total depth drilled was 951 metres. This was followed up by five rotary-drill holes, for a total depth of 2250 metres, for down-hole geophysics. The exploration expenditure was approximately $0.365 million.

The total expenditure for coal exploration in the province in 1993 amounted to about $2.865 million of which $1.42 million was spent on the investigation of thermal coal potential.

A joint Fording Coal Limited/Geological Survey of Canada project was conducted to examine coalbed methane prospects.

HIGHLIGHTS OF EXPLORATION PROJECTS

Gold-enriched porphyry copper deposits, polymetallic massive sulphide deposits (volcanogenic and sedex), and veins and transitional deposits accounted for approximately 85% of 1993 exploration expenditures in British Columbia. The remainder were directed to coal, industrial minerals, skarn, diamonds and less traditional targets such as sedimentary copper and auriferous iron formations. Although most of the exploration programs were focused in and around areas with mines or known showings and existing infrastructure, several new, relatively low budget, regional programs were conducted throughout the province. These keyed on: sedex deposits in the southeast (especially in the Purcell Supergroup) and northeast (*e.g.*, Gataga-Driftpile area); diamonds in the Rocky Mountains; gold deposits in the Interior Plateau of south-central British Columbia; porphyry deposits in the Babine Lake area and epithermal precious metal veins and transitional deposits in the Stewart Camp in the northwest. Some of these projects have advanced very quickly and are mentioned in the previous section (*i.e.*, Huckleberry, Red Mountain). The diversity of targets, their large size (some world class, such as Highland Valley Copper and Sullivan), and the profitable nature of smaller, higher grade deposits such as Snip continue to make British Columbia a good place to explore. The properties mentioned below are shown on Figure 9 and listed in Table 5, with estimated preliminary reserves, where available.

PORPHYRY COPPER-GOLD DEPOSITS

At the Hearne Hill deposit located close to the recently closed Bell Copper mine in the Babine Lake area, Booker Gold Explorations Ltd. completed trenching, a detailed magnetometer survey, and follow-up drilling on one of two breccia-pipe zones. When Booker acquired the property in late December 1992, previous drill-indicated and inferred reserves in the main breccia body located within a large, low-grade porphyry system were estimated at 180 000 tonnes grading 1.7% copper with recoverable gold values contained in the Discovery (Chapman) zone. In January 1992, a prospectus for a Mine Development Certificate was filed on behalf of David Chapman. The proposal was to mine up to 45 000 tonnes of ore and transport it to the nearby Bell Copper concentrator for processing. The early closure of the Bell Copper mine was a setback to development plans. During the 1993 program, Booker discovered another breccia 120 metres northeast of the Discovery zone.

At the Lorraine porphyry copper-gold property, Kennecott Canada Inc. completed geological, geochemical and geophysical surveys and four diamond-drill holes. The program tested for extensions to and better gold grades in the Main zone (previous reserves estimated at approximately 10 million tonnes grading at 0.67% copper and 0.34 gram per tonne gold), and also the Extension zone discovered in 1991.

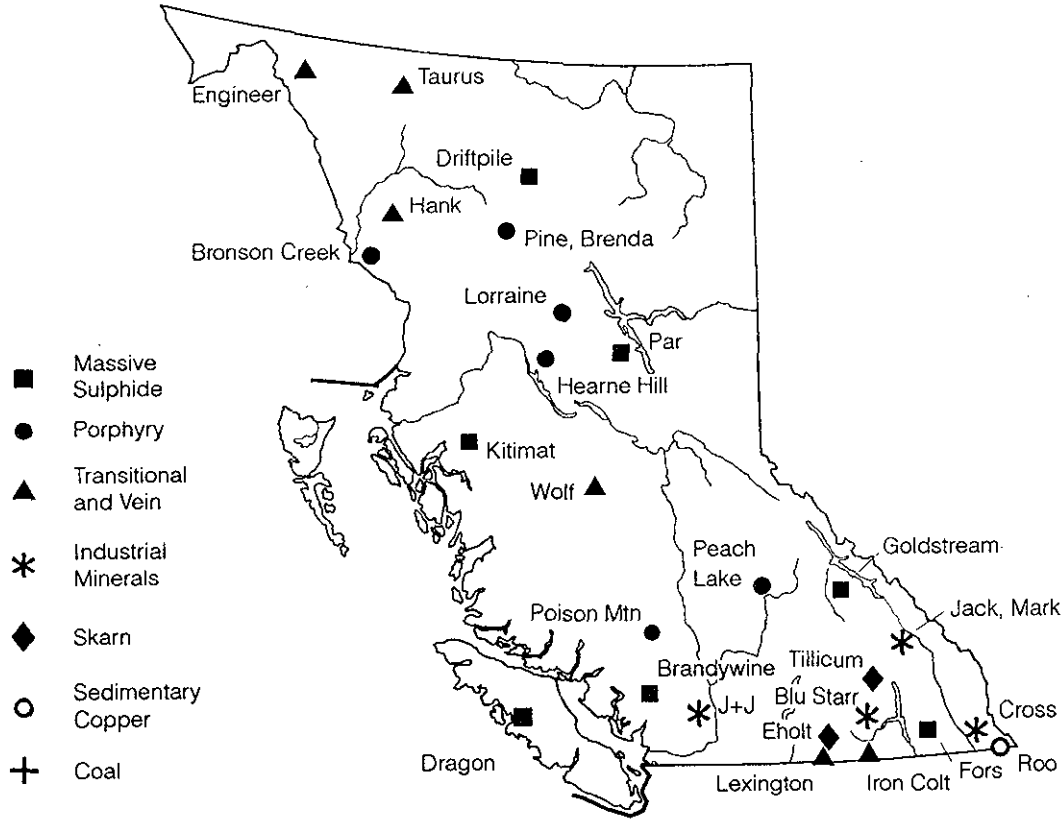


Figure 9. Exploration highlights in British Columbia.

International Skyline Gold Corporation completed an induced polarization survey which identified an anomalous zone measuring 2500 by 460 metres on the Bronson Creek (Red Bluff) porphyry copper-gold deposit. Follow-up diamond drilling totalling 870 metres completed in the fall of 1993, together with data from 2275 metres of drilling previously available to the company, has resulted in a resource estimate of 100 million tonnes of mineralized material. Included within the larger resource is a drill-indicated probable and possible mineral resource of 36 million tonnes with an average grade of 0.16% copper, 0.65 gram per tonne gold, 3.43 grams per tonne silver and 0.01% molybdenum. A large follow-up program is planned for 1994. In addition, Cominco Ltd. completed substantial geotechnical studies of the area under option from Skyline by the Snip joint venture. Drilling also tested extensions to the Twin vein on the Snip property.

Regional Resources Ltd. and GWR Resources Inc. consolidated a large area (150 square kilometres) of claims in the area northeast of Lac La Hache, around the Peach Lake, Spout Lake and Murphy-Miracle properties. Work consisted of compilation, prospecting, reconnaisance geological mapping, geochemical sampling and induced polarization surveys. Targets include the Main (magnetite) skarn, where drilling in early 1993 identified a reserve estimated at 544 200 tonnes grading 1.8% copper, 49% iron and 0.17 gram per tonne gold, the newly discovered Nemrude bornite skarn, the Miracle-Murphy alkalic porphyry copper-gold prospect and a calcalkalic porphyry prospect. Follow-up drilling began in the spring of 1994.

In the southern Toodoggone district, where the Kemess South porphyry copper-gold deposit is in an advanced stage of exploration and permitting, Romulus Resources Ltd. carried out modest drilling programs on the Pine and Brenda porphyry copper-gold prospects. Romulus has an option agreement with Electrum Resources Ltd. and Canasil Resources Inc. covering their respective properties. The four holes on the Brenda property intersected stockwork gold-copper mineralization near the surface and over substantial intervals. Previous work by Canasil has identified epithermal gold-silver mineralization in volcanic rocks in the western section of the property. On the Pine property follow-up drilling tested geochemical and geophysical targets in areas of strong quartz-sericite-magnetite alteration.

At the Poison Mountain porphyry copper-gold-molybdenum prospect, Bethlehem Resources Corporation drilled nine holes on two areas outside the Copper Creek zone where reserves of 280.8 million tonnes grading 0.31% copper, 0.142 gram per tonne gold and 0.007% molybdenum have been outlined by previous operators. Eight holes tested

TABLE 5
1993 EXPLORATION HIGHLIGHTS

Company Name	Project Name	Commodity	Estimated Tonnes (000s)	Estimated Grade	Reference	Exploration Expenditures ($Millions)
Massive Sulphide Deposits						
American Bullion Minerals Ltd.	Kitimat	Cu,Pb,Zn, Au,Ag			News Release, 1993	0.5
Kokanee Explorations Ltd./ Consolidated Ramrod Gold Corp.	Fors/Vine	Pb,Zn,Ag				1.4
La Rock Mining Corp.	Brandywine	Cu,Pb,Zn, Au,Ag				0.3
Teck Corp.	Driftpile	Pb,Zn,Ag	20 000	2.4% Pb + Zn	NM, Oct. 18/93	0.375
Porphyry Deposits						
Bethlehem Resources Corp.	Poison Mountain	Cu,Au,Mo	280 800	0.31% Cu, 0.142 g/t Au, 0.007% Mo	SW, Oct. 28/93	0.2
Booker Gold Explorations Ltd.	Hearne Hill	Cu,Au	180	1.7% Cu	Prospectus MDAP, 1992	0.16
International Skyline Gold Corp.	Bronson Creek	Au			SW, Jun. 24/93	0.5
Kennecott Canada Inc.	Lorraine	Cu,Au	10 000	0.67% Cu, 0.34 g/t Au	Kennecott, 1993	0.22
Skarn Deposits						
GWR Resources Inc./ Regional Resources Inc.	Peach Lake/ Spout Lake	Cu,Au	554.2	1.8% Cu, 0.17 g/t Au,	SW, Mar. 4/93	0.45
Orvana Minerals Corp./ Placer Dome Inc.	Eholt/Motherlode/ Thimble Mtn.	Au,Cu				0.14
Transitional and Vein Deposits						
Bethlehem Resources Corp.	Tillicum	Au			Columbia Gold Mines, 1991	0.9
	Heino-Money		13.6	34.79 g/t Au		
	East Ridge		440	10.26 g/t Au		
Britannia Gold Corp.	Lexington-Lonestar	Au,Cu			Britannia, 1993	0.35
	Lonestar zone		17 600	0.52% Cu, 0.3 g/t Au		
	Northwest zone		900	1.04% Cu, 1.0 g/t Au		
	Main zone		1000	0.93% Cu, 4.5 g/t Au		
Hera Resources Inc.	Taurus	Au	436	7.2 g/t Au	SW, Oct. 27, 1993	0.16
Homestake Canada Ltd.	Hank	Au,Ag			Lac Minerals, 1989	0.15
	200 pit		245	4 g/t Au		
	400 pit		220	2 g/t Au		
International Silver Ridge Resources Inc./ Vangold Resources Inc.	Iron Colt	Au,Ag				0.01
Metall Mining Corp.	Wolf	Au,Ag				0.14
Winslow Gold Corp.	Engineer	Au	20	34 g/t Au	SW, Oct. 15, 1993	0.14

Note: NM = Northern Miner; SW = Stockwatch

and confirmed the Fenton Creek zone where computer modelling of previous drill information indicated the potential for approximately 40 million tonnes of copper-gold mineralization. The ninth hole tested a strong gold anomaly in soils.

POLYMETALLIC MASSIVE SULPHIDE DEPOSITS

Both base metal rich (sedex and volcanogenic) and precious metal rich (volcanogenic) massive sulphide deposits were important targets. The success of projects at Myra Falls (Battle zone), Tulsequah Chief, Eskay Creek and Fors over the past few years bear good testimony to the exploration potential of these deposit types.

In the Gataga district of northeastern British Columbia, Teck Corporation tested a zone of stratabound zinc and lead mineralization at the Driftpile property. Previous drilling had delineated a geological resource estimated at 20 million tonnes of 2.4% combined lead-zinc. Teck's 1993 program followed up three isolated drill holes with better grades, outside the known resource. This drilling intersected a mineralized horizon now interpreted to be on the other limb of a synclinal structure. Teck hopes that the target proves to be at least the same size as the Stronsay (Cirque) deposit located about 100 kilometres to the south within the same belt of favourable rocks. Drilling at Driftpile is expected to resume in June, 1994. Also in the immediate area of the Stronsay deposit, Metall Mining Corporation (under an option agreement with Ecstall Mining Corporation), explored the YN, Pie and Akie claim blocks for sedex mineralization. On the YN claims a five-hole diamond drilling program tested strong multi-element soil anomalies and a barite horizon. On the Pie and Akie claims geochemical and geological surveys were completed. In 1989 and 1990 Teck Corporation drilled the Mount Alcock stratiform lead-zinc-barite deposit located immediately to the north of the Stronsay deposit, in the Kwadacha Wilderness Recreation Area. The drilling tested a 300-metre strike length with assays returning up to 6.9% combined lead and zinc over a core length of 10.5 metres. A deep gravity anomaly remains untested.

At the Brandywine property, approximately 5 kilometres southwest of the Northair mine and 48 kilometres north of the Britannia mine, La Rock Mining Corporation continued diamond drilling in the Main zone (Tedi pit area) and the recently discovered Dave's Pond showing, in its search for a Britannia-style deposit. The showing is hosted by a flat-lying quartz-sericite schist about 300 metres to the northeast of the Main zone. Drilling in the Dave's Pond zone has shown the presence of significant free native gold together with base metal sulphides. On-going drilling is testing the dimensions and continuity of the prospect.

In the Osilinka River area northeast of Germansen Landing, Cominco Ltd. completed a five-hole diamond drilling program on its Par property as a follow up to good results from a 1991 trenching program and an inconclusive 1992 drilling program. The drilling tested lead, zinc and silver mineralization with associated barite in structurally complicated Paleozoic carbonates with minor clastic components.

In the Kitimat area, American Bullion Minerals Ltd. explored a 12-kilometre felsic volcanic belt that hosts over 20 occurrences with characteristics of a polymetallic volcanogenic massive sulphide setting. Work completed included airborne electromagnetic and magnetic surveys followed by ground geochemical and geophysical surveys and mapping, sampling, trenching and diamond drilling on three targets.

In the Purcell Mountains of southeastern British Columbia, Consolidated Ramrod Gold Corporation., with joint venture partners Chapleau Resources Ltd. and Barkhor Resources Inc., continued drilling on the Fors and Vine massive sulphide prospects located in the Moyie Lake area 60 kilometres south of the Sullivan mine. The Sullivan horizon has been intersected by ten widely spaced diamond-drill holes which roughly outline an area of hydrothermal alteration and mineralization. The thicknesses of breccia, basinal muds, and intense alteration, similar in style to that seen at Sullivan, are very encouraging and have helped spark other regional exploration programs. Drilling in late November resumed and over the next few months a total of approximately 3812 metres of diamond drilling in six deep holes.

On the Dragon polymetallic prospect located near Gold River on Vancouver Island, Noranda Exploration Co. Ltd. conducted a drilling program to test a felsic volcanic formation hosting numerous gold-bearing galena and sphalerite showings exposed over widths of 3 to 20 metres. Doromin Resources Ltd., which optioned the Dragon property to Noranda, has identified a new mineralized zone in a similar package of rocks on adjacent claims.

PRECIOUS METAL BEARING VEINS AND TRANSITIONAL DEPOSITS

Exploration targets in this category cover a broad spectrum of hydrothermal, epigenetic mineral deposits. They include high-level epithermal deposits, deeper level mesothermal veins and those that form in the transitional zones between the porphyry environment and vein deposits at intermediate depths, including some skarns (*e.g.*, Red Mountain).

On the Hank epithermal prospect in the Iskut River area, Homestake Canada Ltd. conducted a diamond drilling program focused on a zone of acid sulphate alteration stratigraphically higher than previous drilling. Previous drilling of 96 holes by Lac Minerals Ltd. and Carmac Resources Ltd. outlined a geological reserve of 245 000 tonnes grading 4.0 grams per tonne gold and 218 000 tonnes grading

2.0 grams per tonne gold in the 200 and 400 pit areas, respectively.

At the Engineer epithermal gold mine west of Atlin, under an option agreement with Winslow Gold Corporation, Ampex Mining reaccessed the mine, rehabilitating underground workings on the previously inaccessible Governor vein. A bulk sampling program returned good grades on both the Engineer and Governor veins and visible gold was found in a number of places throughout the Engineer and Double Decker veins. Ampex believes that approximately 20 000 tonnes or more of potential ore are readily available at an average grade of approximately 34 grams per tonne gold. With the hope that the Engineer, Double Decker and Governor veins have sufficient tonnage to support a smaller scale mining operation, Ampex plans to purchase a 50 tonne per day mill and bring the mine back into production in late 1994. The company is also testing the market for specimen sales.

On the Taurus mesothermal gold property near Cassiar, Hera Resources Inc. conducted a trenching program which exposed four new gold-bearing quartz veins extending up to 150 metres in length, west of the existing underground workings. Follow-up diamond drilling of twenty-six holes totalling approximately 1500 metres tested the vein system to depth. Based on positive results and a preliminary reserve estimated at 436 300 tonnes grading 7.2 grams per tonne gold, the company accelerated a second phase of diamond drilling beginning in January 1994. It consisted of 1112 metres in 20 holes. Underground exploration and development and surface drilling and trenching of the vein systems to prove ore reserves began in the spring of 1994.

On the Wolf epithermal gold prospect, in the Interior Plateau region of central British Columbia, Metall Mining Corporation conducted detailed geological, geochemical and geophysical surveys with follow-up trenching. A major drilling program is planned for 1994. The prospect has potential for both bonanza and bulk-mineable deposits of the low-sulphidation adularia-sericite subtype of epithermal deposits, hosted by Tertiary rhyolitic volcanic rocks.

In the Rossland Camp, International Silver Ridge Resources Inc. and Vangold Resources Inc. continued their underground program to explore high-grade gold mineralization on the Iron Colt property. Two shear-hosted veins, similar to those of the prolific Le Roi and other mines in the camp, were exposed and are believed to be an eastern extension of the main Le Roi vein system where 93 310 kilograms of gold were mined from 1898 to 1941. A total of 915 metres of rehabilitation and underground drifting on the number 6 level and 90 metres of raising in the area of high-grade drill intersections were completed in 1993. In addition, 610 metres of rehabilitation and 23 metres of drifting were completed in the Alberta tunnel. Underground development work has begun. Plans include a 4500-tonne bulk sample for test milling and blocking out sufficient reserves to support mining, with ore to be custom milled at the Standard mill at Slocan.

In the Greenwood camp, Britannia Gold Corporation conducted a diamond drilling program on its Lexington-Lonestar property, testing for additional copper-gold mineralization. Previous reserves were estimated at 17.6 million tonnes grading 0.52% copper and 0.3 gram per tonne gold in the Lone Star zone, 0.9 million tonnes grading 1.04% copper and 1.0 gram per tonne gold in the Northwest zone, and 1.0 million tonnes grading 0.93% copper and 4.5 grams per tonne gold in the Lexington main zone. Mineable reserves in the Main zone are estimated at 131 515 tonnes grading 9.6 grams per tonne gold and 1.45% copper. In 1993 drilling on the TG 81 zone, located approximately 200 metres north of the Main zone, was designed to test its continuity. Drilling in the Golden Cache area, approximately 3000 metres north of the Main zone, tested a significant magnetic anomaly associated with copper-gold mineralization. Although the property has open-pit potential, management is primarily focusing on developing the bulk-tonnage underground gold-copper potential.

SKARN DEPOSITS

Also in the Greenwood camp, Orvana Minerals Corporation and Placer Dome Inc. explored the Eholt, Motherlode and Thimble Mountain gold skarn properties which occur in a similar geologic setting to the old Phoenix mine. At Eholt, drill testing by Orvana Minerals of an unusually large magnetic anomaly intersected a Triassic ash-fall tuff with anomalous gold and copper values associated with magnetite. At Motherlode, drilling by Orvana Minerals intersected significant gold skarn mineralization within a sequence of Knob Hill cherts, including 10.9 metres grading 3.08 grams per tonne gold. At Thimble Mountain, Placer Dome's program, including trenching, further defined drill targets.

INDUSTRIAL MINERALS

Exploration and market interest in industrial minerals continues to increase, in part as a result of the continued slow-down in metallic minerals activity and in part as a trend towards diversification.

In southern British Columbia, particularly, new applications for various types of construction stone products have been advancing steadily. Among these are projects to produce marble, limestone and granitic dimension stone. There are development opportunities for such materials as aggregate, refractory and advanced ceramic minerals, talc, vermiculite, garnet and kaolin. High unit-value commodities such as magnesite and jade serve worldwide markets.

In the southern Fraser Canyon, Cromlech Ltd. recovered unconsolidated silica and feldspar sand at Scuzzy Creek, near Boston Bar. Quality Mineral and Industry Supply Co. Ltd. proposed to develop a sodic feldspar deposit at Sumas Mountain near Abbotsford.

Examples of successful, high-quality industrial mineral operations are the barite and silica mines of Mountain Minerals Ltd. (*e.g.*, Mt. Moberly) near Golden. This company has been a long-established supplier of barite to the drilling industry and more recently for filler applications, and quartz to glass producers. Elsewhere in the region, Baymag Mines Company Limited produces magnesite (Mt. Brussilof); gypsum is mined at Lussier River and Windermere by Domtar Construction Materials Ltd. and Westrock Industries Ltd., respectively. Lime for cement and other industrial uses is produced by Lafarge Ltd. at Kamloops and Continental Lime Ltd. at Pavillion Lake. Limestone operations on Texada Island supply the cement and lime industries in the Lower Mainland of British Columbia, the Puget Sound area in Washington, and the Portland area in Oregon. Several small operations by IMASCO Ltd. near Creston and in Surrey are a steady major supplier of white calcium carbonate filler for paints and plastic industries in the Pacific Northwest. The IMASCO operation at Benson Lake on Vancouver Island has been expanding its shipping/loading capacity in Port Alice.

New developments in 1992/1993 included: production of granite blocks from eight different sites in southwestern British Columbia by Margranite Industries Ltd. and B.C. Granite Ltd.; production of marble from two sites on Vancouver Island by Leo D'Or Mines Ltd. and Matrix Marble Corp.; marketing of a zeolite deodorant/absorbent product from the Cache Creek area by Mountain Minerals Ltd.; the processing of cinder cone material at Nazko by Canada Pumice Ltd., primarily for barbecue products, and the processing and shipping of a 9000-tonne silica sample by New Global Resources Ltd. from its 'geyserite' pyrophyllite-quartz deposit located on tidewater at Easy Inlet on the west coast of Vancouver Island. New Global has submitted a prospectus seeking to obtain permits to quarry, crush, stockpile and ship between 70 000 and 100 000 tonnes of silica per year to the Tilbury portland cement plant at Delta, British Columbia.

At the Pacific Talc Ltd. J&J talc property near Boston Bar, a new deposit was discovered that could add significantly to the previously estimated reserves sufficient for more than 40 years of production. A significantly large quantity of the talc to be produced from the J&J property is being targeted as a pigment in the paper industry of the Pacific Northwest.

The diamond frenzy which has gripped the Northwest Territories, Alberta and Saskatchewan, spilled over into southeastern British Columbia. In the Crossing Creek and Boivan Creek areas, Consolidated Ramrod Gold Corporation explored chromium-nickel anomalies for undiscovered kimberlite intrusions on the west side of the Elk valley. The area contains the Cross kimberlite pipe and several associated kimberlite dikes on the Ice property. An airborne magnetic survey assisted in defining the limits of possible kimberlites. Speculative staking has occurred from the U.S. border northwards to beyond Golden. Similarly, the area of the Rossland Range between Christina Lake and Big Sheep Creek and from the U.S. border to Highway 3, has been staked for its diamond potential. Programs were carried out on the previously located diamondiferous Jack and Mark properties north of Golden.

At Passmore in the Slocan Valley, owners of the Blue Starr sapphire property continue to discover, process, and market their sapphires, gem-quality titanite and aquamarine, and high museum quality black and smokey grey quartz crystals.

OTHER TARGETS

Both property-scale and regional exploration programs were conducted for sedimentary copper-cobalt±silver deposits in the southeast part of the province. Noranda Exploration Co. Ltd. completed a modest drilling program on the Roo sandstone-siltstone (red bed) copper-cobalt prospect in the Sheppard Formation, on Phillips Creek near the Roosville border crossing.

NEW INITIATIVES IN BRITISH COLUMBIA

Several new programs that will have a significant influence on future mineral resource planning, exploration and development in British Columbia were initiated in 1993.

On March 11, 1993 a *Mineral Strategy for British Columbia* was released by the provincial government to revitalize the exploration sector, improve industry competitiveness and maximize value-added opportunities. On March 22, 1994 the provincial government announced a $100 million program to boost mining investment in the province over the next five years. The program has several key elements:

- 133% deductibility of capital costs for new mines and major expansions;
- Parity under the province's Mineral Tax Act between coal and metals and reducing the coal taxes by 50%;
- Mineral tax deductibility against corporate income tax;
- Pooling of exploration expenditures by company, allowing maximum flexibility for exploration expenditures;
- Explore BC, a three-year, $13.5 million incentive program to exploration providing up to one-third of exploration costs per property with a $150 000 maximum;
- Prospector's assistance up to $10 000 in a three-year program for qualified prospectors.

In April 1993, the Ministry of Energy, Mines and Petroleum Resources Mineral Resources Division was reorganized to increase its regional presence and to allow a

more proactive role in land-use planning. Under the Corporate Resource Inventory Initiative, the Geological Survey Branch continued to prepare updated mineral potential maps for the Commission on Resources and Environment. The mineral potential assessment process includes the formation of methodologies, mineral deposit modeling and expert estimates of undiscovered resources, designed to rank the land base of British Columbia according to its ability to sustain mineral exploration and production. The Vancouver Island and Cariboo-Chilcotin studies were completed. The Kootenay regional studies are well advanced and studies began on the Nass-Skeena and Thompson-Okanagan areas.

The Geological Survey Branch programs were refocused in 1993. Five integrated multi-disciplinary projects were carried out in regions where existing mines are forecast to close in the next few years (Northern Vancouver Island, Interior Plateau, East Kootenays, northern Selkirks and Tulsequah). Results of these programs are expected to encourage exploration in these areas.

Discussions continued with the First Nations designed to provide them with a more equitable role in mineral exploration and development decision-making within their traditional territories.

A new initiative by the Ministry of Energy, Mines and Petroleum Resources and B.C. Trade Development Corporation will stimulate the development of industrial minerals. The initiative will carry out promotional activities to reach industry representatives in British Columbia, Pacific Rim countries and Europe, with the objective of developing new markets and attracting capital investment. Initial efforts will focus on promoting value-added refractory and ceramic minerals, and dimension stone. The provincial government has developed a protocol agreement between the Ministry of Energy, Mines and Petroleum Resources and the Ministry of Environment, Lands and Parks to streamline the administration of industrial minerals and Crown Land quarry resources.

SUMMARY AND OUTLOOK FOR 1994

During 1993, the exploration industry in British Columbia concentrated on the evaluation of many previously explored targets, particularly near existing infrastructure. Several advanced projects received further work in anticipation of improved metal markets and favourable resolution of uncertainties in land-use policies. Several smaller, high-grade gold projects have and will continue to take advantage of the custom milling facilities available throughout the province by obtaining the necessary permitting for bulk sampling.

The many copper-bearing porphyry deposits discovered during the 1960s and 1970s continue to receive attention focused on the search for zones of higher grade copper with or without gold credits. Copper prices will dictate their ultimate economic viability. Sedex and volcanogenic polymetallic massive sulphide deposits offer small to medium tonnage and high grade potential, particularly those enriched in precious metals. The stratiform, gold-enriched Eskay Creek deposits are examples of low tonnage, but potentially extremely profitable, high-grade targets. The transitional setting, which includes vein and skarn deposits (*e.g.*, Red Mountain) offers similar small to medium tonnage and high grade potential. Exploration for both metallurgical and thermal coal has increased, as has the search for and development of industrial minerals products.

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TABLE 6
ACTIVE EXPLORATION PROPERTIES IN BRITISH COLUMBIA, 1993

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
NORTHWESTERN DISTRICT						
Allin (Equity Silver Mines Ltd.)	093L 293	Omineca	93L/1	Ag, Cu, Au	Epithermal Acid Sulphate	IP, 28 km; geochem; 7 ddh, 1001 m
Anyox (TVI Copper Inc.)	103P 021	Skeena	103P/5	Cu, Zn	Besshi VMS	Geol; prosp; mag; VLF; 21 ddh, 4256 m; downhole pulse EM
Ball Creek (Colossal Res. Corp.)	104G 042	Liard	104G/8	Cu, Au	Alkalic Porphyry	3 ddh, 659 m
Bronson J.V. (Cominco Ltd./Prime Res. Gp Inc.)	104B 300	Liard	104B/11	Au	Shear Vein	IP; UTEM; VLF; mag; HLEM; 7 ddh, 940 m
Bruceside (Newhawk Gold Mines Ltd.)	104B 193	Skeena	104B/8	Au, Ag	Epithermal Vein	Geol; channel sampling; 31 ddh, 4120 m
Corey (Kenrich Mining Corp/ Ambergate Expl.)	104B 233, 011, 354	Skeena	104B/8	Au, Ag, Cu, Pb, Zn	Epithermal Shear Vein	Geol; geochem; VLF; mag; trenching
Engineer (Ampex Mining)	104M 014	Atlin	104M/8	Au	Epithermal Vein	U/g rehabilitation; bulk sample; prosp
Eskay Creek/GNC (Prime Res. Group Inc.)	104B 008	Skeena	104B/9	Au, Ag	VMS	8 ddh, 1607 m
Fox (Geofine Exploration Cons. Ltd.)		Skeena	104A/11, 12	Au	Epizonal Porphyry Gold	Geol; geochem; IP and mag, 5.75 km
Golden Bear (North American Metals Corp.)	104K 079	Atlin	104K/1	Au	Epithermal Shear Zone	IP; VLF; mag; 17 ddh, 3327 m
Hank (Homestake Canada Inc.)	104G 107	Liard	104G/1,2	Au	Epithermal Hotspring	5 ddh, 658 m
Hearne Hill (Booker Gold Expl. Ltd.)	093M 006	Omineca	93M/1	Cu, Au	Porphyry/Breccia Pipe	Mag; trenching; 21 pdh, 914 m
Huckleberry (New Canamin Res. Ltd.)	093E 037	Omineca	93E/11	Cu	Porphyry	Air EM; mag;VLF; radiometrics; Geol; 85 ddh, 13405 m
Kitimat	103I 014,	Skeena	103I/2	Cu, Zn,	VMS, Skarn,	Air mag/EM/radiometrics, 250 km; geol;
(American Bullion Minerals Ltd.)	104, 169			Ag, Au	Vein	geol; geochem; trenching; 14 ddh, 1224
Lawyers (Cheni Gold Mines Inc.)	094E 066	Omineca	94E/6	Au, Ag	Epithermal Vein	36 ddh, 3439 m
Nat (Noranda Explor. Co. Ltd.)	093M 162	Omineca	93M/1	Cu, Au	Porphyry	Air mag/EM; ground geophys; geochem; geol; 3 ddh, 400 m
Pitt/Trinity (Inco Ltd.)	103H 066	Skeena	103H/12	Cu, Pb, Zn, Ag, Au	Replacement, VMS	7 ddh, 1765 m

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Polaris Taku (Golden Angus Mines Ltd.)	104K 003	Atlin	104K/12	Au	Mesothermal Vein	Geol; geochem; 8 ddh, 1297 m
Premier Gold (Westmin Res. Ltd.)	104B 153	Skeena	104B/1	Au, Ag	Epithermal Adularia Vein	3 ddh, 1752 m
Red Mountain (Lac Minerals Ltd.)	103P 086	Skeena	103P/13	Au, Ag	Epizonal Porphyry Gold	U/g development, 780 m; 80 sfc ddh, 28801 m; 95 u/g ddh, 8526 m; IP, 50 km; mag; radar; metallurgy
Reg (Skyline) (International Skyline Gold Corp.)	104B 107	Liard	104B/11	Au	Shear Vein, Cu-Au Porphyry	IP, 10.3 km; 45 ddh, 2728 m
Saddle Hill (Phelps Dodge Corp. of Canada,	093M 008	Omineca	93M/1	Cu, Au	Porphyry	Air mag/VLF, 141 km; 6 ddh, 781 m
SB (Westmin Res. Ltd/ Tenajon Res. Corp.)	104B 150	Skeena	104B/1	Au, Ag	Epithermal Vein	U/g development, 130 m raise, 154 m drift; 2600 t bulk sample; 91 u/g ddh, 2679 m
Snip (Cominco Ltd.)	104B 250	Liard	104B/11	Au	Epithermal Shear/Vein	IP, 28 km; 22 ddh, 4900 m
Snowfield (Newhawk Gold Mines Ltd.)	104B 179	Skeena	104B/9	Au	Porphyry, Vein	Channel sampling; 6 ddh, 1459 m
Stewart (Trev Corp.)		Skeena	104A/4	Au, Cu, Zn	Epizonal Porphyry Gold	Geol; geochem; 4 ddh, 456 m
Strike (Navarre Res. Corp.)	104A 068	Skeena	104A/4	Au, Ag, Pb, Zn, Cu	Vein, breccia, VMS?	Geol; trenching; 7 ddh, 955 m
Table Mountain (Cusac Industries Ltd.)	104P 070	Liard	104P/4	Au	Mesothermal Vein	17 ddh, 1523 m
Taurus (Hera Res. Inc.)	104P 011, 12	Liard	104P/5	Au	Mesothermal Vein	Trenching; 26 ddh, 1600 m
Telkwa (Manalta Coal Ltd.)	093L 152, 156	Omineca	93L/11	Coal (thermal)		Geophys, 21 km; 46 rotary dh, 4453 m; 11 ddh, 2074 m; downhole geophys; geotech; ARD test
Trek (Warner Ventures Ltd.)	104G 029	Liard	104G/3	Au, Cu	Shear Vein, Mesothermal?	Prosp; 6 ddh, 378 m
Tulsequah (Redfern Res. Ltd.)	104K 002	Atlin	104K/12, 13	Cu, Pb, Zn, Ag, Au	Kuroko VMS	Geol; mag; VLF; IP, 102 km; EM; HLEM; 20 ddh (Tuls Chief), 8061 m; 12 ddh (Big Bull), 3556 m

CENTRAL DISTRICT

Brenda (Romulus Res. Ltd.)	094E 107	Omineca	94E/2,7	Au	Vein?	4 ddh, 958m
Brewster Lake (Cogema Canada Ltd.)		Omineca	93E/7	Au, Ag	Epithermal	Geol; aeromag
Cat (Lysander Gold Corp.)	094C 069	Omineca	94C/3	Au, Cu	Porphyry	10 ddh; geophys

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Chuchi Lake (Laroth Engineering Ltd.)	093N 159	Omineca	93N/7	Cu, Au	Porphyry	2 ddh 100 m; geochem
Cutoff (Cogema Canada Ltd.)		Omineca	93F/10	Au, Ag	Epithermal	Geol; aeromag
Cygnet (Cominco Ltd.)	094C 073	Omineca	94C/5, 6	Pb, Zn, Ag	Rept Veins	Geol; geochem
Driftpile (Teck Expl. Ltd.)	094F 003	Liard	94F/13	Pb, Zn, Ag	Sedex	13 ddh; geol; reclamation
Fawn *(Western Celtic Mines Inc.)*	093F 053	Omineca	93F/3	Au, Ag	Rept Vein	5 ddh 1000 m; geophys
Goldway (Noranda Explor. Co. Ltd.)	094D 027	Omineca	94D/8	Cu, Au	Porphyry	50 tp
Granite Basin *(Canasil Res. Inc.)*	094C 009	Omineca	93C/5	Au, Cu	Porphyry	Tr; tp; geochem; geophys
Indata (Eastfield Res. Ltd.)	093N 192	Omineca	93N/6	Au, Ag	Rept Veins	15 km road
Kemess (El Condor Res. Ltd.)	094E 094	Omineca	94E/2	Au, Cu	Porphyry	18 ddh 1247 m; baseline
King, Queen (Electra Mining Consol. Ltd.)		Omineca	93N/15	Pb, Zn, Ag	Rept Veins?	Geol; geochem
Kliyul Creek (Noranda Explor. Co. Ltd.)	094D 113	Omineca	94D/8, 9	Au, Cu	Porphyry	6 pdh 558 m; 280 tp; geophys
Lemon Lake (Canim Lake Gold Mines Ltd.)	093A 002	Cariboo	93A/6	Cu, Au	Porphyry	Pdh and ddh
Lorraine (Kennecott Canada Inc.)	093N 002	Omineca	93N/14	Cu, Au	Porphyry	4 ddh 551 m; geol
Lustdust (Alpha Gold Corp.)	093N 009	Omineca	93N/11	Ag, Au	Rept Veins	21 ddh 200 m; geol
Par (Cominco Ltd.)	094C 024	Omineca	94C/2, 3	Pb, Zn, Ag	Rept Veins	5 ddh 520 m; road
Pine (Romulus Res. Ltd.)	094E 016	Omineca	94E/2, 7	Au, Cu	Porphyry	9 ddh 1700 m
Poco Ridge (Noranda Explor. Co. Ltd.)	094B 007	Omineca	94B/3, 4	Pb, Zn, Ag	Vein	Geochem; geophys
Profit (Noranda Explor. Co. Ltd.)		Liard	94G/12	Pb, Zn, Ag	Sedex?	Line; geochem; geophys
South Gataga (Minnova Inc.)	094F 023	Omineca	94F/6,7,11	Pb, Zn Ag	Sedex	20 ddh; VLF; IP; gravity
Tas (A.D. Halleran)	093K 080	Omineca	93K/16	Au, Cu	Porphyry	90 t bulk sample

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Uduk Lake (Pioneer Metals Corp.)		Omineca	93E/9	Au, Ag	Rept Veins?	Geochem
Willow Creek Coal (Globaltex Industries Inc.)	093O 008	Liard	93O/9	Coal	Sedimentary	Bulk samples; pre-prod
Wishaw Quarry (Ava Res. Ltd.)	093H 131	Liard	93H/16	Stone	Metamorphic	Road rehab; samples
Yellow Moose (Cogema Canada Ltd.)		Omineca	93F/6, 11	Au,Ag	Epithermal	Tp; geol; aeromag
Wolf (Minnova Inc.)	093F 045	Omineca	93F/3	Au, Ag	Epithermal	20 ddh; geol; geochem; IP
Quartz Lake (Cogema Canada Ltd.)		Cariboo	93C/9	Au	Epithermal	Geol; aeromag
Spanish Mt (Cogema Canada Ltd.)	093A 043	Cariboo	93A/11	Au	Phyllite-hosted	Bulk sample; mill tests

SOUTH-CENTRAL DISTRICT

Bell Creek (Westmin Resources Ltd.)	092HSE067	Similkameen	92H/2E	Cu, Au, Zn	Massive Sulphide	Geophys 15 km; geochem, 325 soil & rock
Blackdome (Blackdome Gold Corp.)	092O 053	Clinton	92O/8W	Au, Ag	Vein	Rehab adits, mill, roads
Bralorne (Avino Mines & Resources Ltd.)	092JNE001	Lillooet	92J/15W	Au	Vein	40 trch; geochem; u/g rehab - Bralorne, King mines
Brett (Liquid Gold Resources Inc.)	082LSW110	Vernon	82L/4E	Au, Ag	Vein	7 pdh, 730 m; road; 25 trch
Broken Ridge (NB-6) (Teck Exploration Ltd.)		Kamloops	82M/5W	Cu, Zn, Pb, Ag, Au	Massive Sulphide	5 ddh, 616 m; geophys (SP, 3.4 km)
Bys 1 & 2 (CP Rail)	092INW013	Kamloops	92I/11, 14	Rock ballast	Industrial Mineral	6 ddh, 180 m
Chataway (CVS) (Aucumo Resources Ltd.)	092ISE150	Kamloops	92I/7W	Cu, Mo, Au	Porphyry	13 ddh, 3919 m
Elk (Fairfield Minerals Ltd.)	092HNE134	Similkameen	92H/16W	Au, Ag	Vein	11 pdh, 942 m; u/g development; bulk sample 2000 tonnes
Fish Lake (Taseko Mines Ltd.)	092OSW041	Clinton	92O/5E	Cu, Au	Porphyry	7 ddh (geotechnical drilling); Prefeasibility engineering studies
Getty North (Getty Copper Corp.)	092INW040	Kamloops	92I/10W, 11E	Cu, Mo, Au	Porphyry	5 ddh, 560 m
Gold Ridge (Highland Talc) (Highland Talc Minerals Ltd.)	092ISW063	Kamloops	92I/04E	Talc	Industrial Mineral	Bulk sample 100 t

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Goldstream (Bethlehem Resource Corp.)	082M 141	Revelstoke	82M/9W, 10E	Cu, Zn	Massive Sulphide	10 ddh, 2400 m; geochem, 275 soil
GW (Zeacan Products Ltd.)		Similkameen	92H/07E	Zeolite	Industrial Mineral	9 ddh, 3048 m
Hagen Mountain (Nat 1) (BC Feldspar Corp.)		Kamloops	92P/1	Potassium Feldspar	Industrial Mineral	Pre-development stripping; engineering & geological studies
Jack (Consolidated Venturex Hlds. Ltd.)	082N 088	Golden	82N/14E	Diamonds	Diatreme	Bulk sample, 120 t
Kingfisher (Poplin-Pagu Exploration Ltd.)	082LNE006	Vernon	82L/10E/ 10W	Marble	Industrial Mineral	Geophys, ddh, trch
Kurtis/Bluehawk (Searchlight Resources Inc.)	082ENW002	Vernon	83E/13E	Au, Ag	Vein	5 ddh, 610 m
Laredo/Puma (Peter F. Wishart)		Osoyoos	82E/05W	Au, Cu	Vein	33 ddh, 300 m
Lumby (Quinto Mining Corp.)	082LSE006	Vernon	82L/6E, 7W	Au, Graphite	Vein	U/g devel, bulk sample - 10 000 t
Lac La Hache (Miracle) (Regional Resources Ltd.)	092P 020	Clinton	92P/14W	Cu, Au	Porphyry	14 ddh, 3050 m; geochem; geophys (IP, mag), 100 km
Monashee (Cameco Corp. (U.S.A.)	082LSE001	Vernon	82L/01W	Au	Vein	Geophys (mag, VLF) 40 km; geochem 580 soil/silt, geol
Mount Skinner (Ottarasko Mines Ltd.)	092N 039	Clinton	92N/9W	Au, Ag	Vein	Bulk sample 30 t
NBS 16,17 (Cromlech Ltd.)	092HNW052	New West.	92H/13E	Silica, Feldspathic Sand	Industrial Mineral	Bulk sample
Perkins Peak (Kleena Kleene Gold Mines Ltd.)	092N 010	Cariboo	92N/14	Au, Ag	Vein	U/g development
Poison Mountain (Bethlehem Resource Corp.)	092O 046	Clinton	92O/2E	Cu, Mo, Au	Porphyry	10 ddh, 2570 m; geochem, 4.3 km
Ranchlands (Mountain Minerals Co. Ltd.)		Kamloops	92I/14E	Zeolites	Volcanogenic	5 pdh, 200 m, road; bulk sample 3125 t
Rey Lake (Hera Resources Inc.)	092ISE160	Nicola	92I/07E	Au, Ag, Cu, Mo	Skarn	16 ddh, 650 m; road
Similco (Similco Mines Ltd.)	092HSE013	Similkameen	92H/7E	Cu, Au	Porphyry	Geol, geophys (airborne, ground)
Snowflake (Jacques Levesque)	082ESW091	Osoyoos	82E/4E	Au, Ag	Vein	U/g bulk sample, 100 t
Wayside (Wayside Gold Mines Ltd.)	092JNE030	Lillooet	92J/15W	Au	Vein	U/g rehab; 27 ddh, 1693 m

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Wood (Charles Boitard)		Kamloops	92I/10E	Cu, Au	Porphyry	4 pdh, 359 m; 3 ddh, 367 m

KOOTENAY DISTRICT

Arrow (Teck Exploration Ltd.)	082LSE027	Slocan	82K/5W, L8E	Pb, Zn, Ag	Sedex	9 ddh, 944 m; geochem
Blue Robin (Consolidated Ramrod Gold Corp.)		Fort Steele	82F/8E	Au	Vein	14 ddh, 1634 m; trenching; geochem; geophys
Elkview (Elkview Coal Corp.)	082GNE013-17, 23	Fort Steele	82G/10W, 15W	Coal	Sedimentary	28 rdh, 1617 m
Fording River (Fording Coal Ltd.)	082JSE009, 010, 012	Fort Steele	82J/2W	Coal	Sedimentary	73 rdh, 16484 m
Fors (Consolidated Ramrod Gold Corp., Chapleau Resources Ltd.)	082GSW035	Fort Steele	82G/5W	Zn, Pb, Ag, Au	Sedex	18 ddh, 7172 m; geophys
Franklin (Sway Resources Inc.)	082ENE002, 003, 009, 051	Greenwood	82E/9W	Au, Ag, Cu, Pb, Zn	Vein, Replacement	21 ddh, 1701 m; 15 u/g ddh, 427 m
Greenhills (Fording Coal Ltd.)	082JSE007	Fort Steele	82J/2W	Coal	Sedimentary	90 rdh, 20 215 m
Horn (Metall Mining Corp.)	082FNE062	Fort Steele	82F/9E	Pb, Zn	Sedex	2 ddh, 1438 m; geochem; geophys
Howell Creek/Flathead (Phelps Dodge Corp. of Canada Ltd.	082GSE037, 048, 70	Fort Steele	82G/2E	Au	Vein, Stockwork	6 ddh, 890 m; trenching
Ice (Consolidated Ramrod Gold Corp.)		Fort Steele	82J/2W	Diamonds	Magmatic	Geochem; airborne geophys
Iron Colt (Internation Silver Ridge Res. Inc., Vangold Res. Inc.)	082FSW100	Trail Creek	82F/4W	Au, Ag, Cu, Co	Vein	U/g drifting & raising
Lexington (Britannia Gold Corp.)	082ESE041, 042, 043	Greenwood	82E/2E	Cu, Au	Vein, Replacement	13 ddh, 1862 m; trenching; geophys
Libby (Consolidated Ramrod Gold Corp.)	082FSW003	Nelson	82F/3E	Pb, Zn	Sedex, Replacement	8 ddh, 833 m; geophys
Line Creek (Line Creek Resources Ltd.)	082GNE020, 021, 022	Fort Steele	82G/15E,W	Coal	Sedimentary	10 ddh, 2058 m; 298 rdh, 28 123 m; trenching; geophys

Property (Operator)	MINFILE Number	Mining Division	NTS	Commodity	Deposit Type	Work Done
Tillicum Mountain (Bethlehem Resources Corp.)	082FNW234	Slocan	82F/13E	Au replacement	Skarn, 5500 t bulk sample.	6 u/g ddh, 250 m; drifting;
Vine (Consolidated Ramrod Gold Corp.)	082GSW050	Fort Steele	82G/5W	Pb, Zn, Ag, Cu, Au	Vein, Sedex	4 ddh, 1885 m; geophys
SOUTHWESTERN DISTRICT						
Bonanza (Braddick Resources Ltd.)	092L 164	Nanaimo	92L/7W	Cu, Fe, Au, Zn, Ag	Skarn	Geol; geochem; geophys
Brandywine La Rock Mining Corp.)	092JW001	Vancouver	93J/3E	Cu, Pb, Zn, Ag, Au	Massive Sulphide Shear/Vein	38 ddh, 2839 m
Cimadoro (Inco Expln. & Tech. Services)	103F 052	Skeena	103F/1	Cu, Pb, Zn, Ag, Au	Massive Sulphide Sedex (?)	4 ddh, 1000 m
Debbie (Whitehawk Ventures Inc.)	092F 331	Alberni	93F/2E	Au	Vein	U/g devel. 200 m
Dragon (Noranda Explor. Co. Ltd.)	092E 72	Alberni	92E/15W	Cu, Pb, Zn, Ag, Au	Massive Sulphide	2 ddh, 300 m; geol; geochem
Harrison Gold (Pacific Comox Gold Corp.)	092HSW092	New West.	92H/5E	Au	Vein/ Stockwork	2 ddh, 750 m
Island Copper (BHP Minerals Canada Ltd.)	092L 158	Nanaimo	92L/11W	Cu, Mo, Au, Ag, Rh	Porphyry	33 ddh, 5566 m
Leo D'or Marble (Leo D'or Mining Inc.)	092L 339	Nanaimo	92L/7W	Marble		Bulk sample
Madhat (Orvana Mineral Corp.)	092L 176	Nanaimo	92L/5E	Cu, Au	Porphyry	5 ddh, 600 m; geophys
Monteith Bay (Monteith Bay Resources Ltd.)	092L 343	Alberni	92L/3W	Silica		14 ddh, 550 m; bulk sample
Myra Falls (Westmin Resources Ltd.)	092F 330 092F 073	Alberni	92F/12E	Cu, Pb, Zn, Ag, Au	Massive Sulphide	2 ddh, 1000 m; 10 u/g ddh 3200 m; u/g devel. 100 m; geophys
Pum (Great Pacific Pumice Inc.)	092JW040	Lillooet	92J/11W	Pumice		Bulk sample
Seneca (Metall Mining Corp.)	092HSW013 092HSW139	New West.	92H/5W	Cu, Zn, Pb, Au, Ag	Massive Sulphide	Geophys
Teeta Creek (Great Western Gold Corp.)	092L 054	Nanaimo	92L/5E	Au, Ag, Cu, Pb, Zn	Vein	10 ddh, 1000 m
Tsolum Creek (Canadian Occidental Petroleum Ltd.)	092F 318	Nanaimo	92F/14W	Coal		Reflection seismic
Vananda Gold (Vananda Gold Ltd.)	092F 269	Nanaimo	92F/15E	Au, Ag, Cu, Pb, Zn	Skarn	9 ddh, 3289 m

NORTHWESTERN REGION

By Paul Wojdak, P. Geo.
Regional Geologist, Smithers

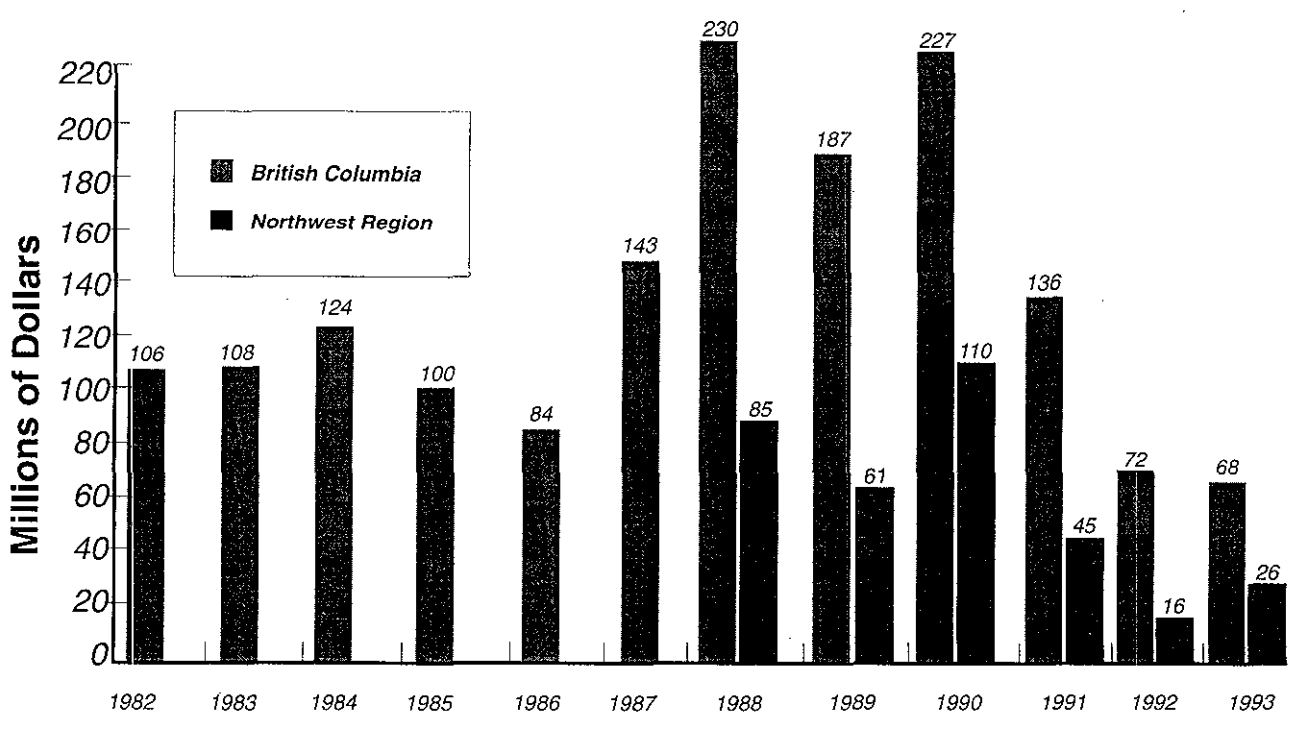
OVERVIEW AND TRENDS

Exploration activity in northwestern British Columbia increased very significantly in 1993 over 1992. Estimated expenditures were $26.5 million versus $16 million in 1992. The Red Mountain project represented by far the largest expenditure and most significant project, but the overall increase in exploration spending is more than can be attributed to the Red Mountain project alone. The possibility of a real improvement in the health of the exploration industry in northwest British Columbia is indicated. This trend contrasts with other regions of the province and the four contributing factors are worthy of comment.

The progressive increase in the price of gold during mid-summer resulted in several projects proceeding late in the season. Examples include programs at the Table Mountain, Trek, Skyline and Taurus properties. Of course, the stronger gold price benefited all regions but three additional factors were significant for mineral exploration in northwestern British Columbia.

First, the health of two operating mines improved significantly and resulted directly in major exploration projects. The successful resumption of underground mining at Golden Bear, under the management of Wheaton River Minerals Ltd., led to exploration discoveries in the Grizzly and Kodiak zones which have dramatically altered the outlook for this operation. At Premier Gold, continuing profitability of underground mining prompted exploration both at Premier and the SB property, the latter as a potential source of custom milling ore. The improved viability of Golden Bear and Premier Gold mines is a real credit to management and production staff at these operations and is not due merely to a stronger gold price.

The second factor contributing to increased exploration activity in northwestern British Columbia is increased recognition of the fabulously rich Eskay Creek gold-silver orebody, a volcanogenic massive sulphide deposit with a bonanza-grade epithermal element assemblage. A positive feasibility study was completed and an application for mine development was submitted by Prime Resources Group Inc. and Stikine Resources Ltd. in November, 1993. Eskay Creek ore genesis and regional geology have become better understood through dissemination of studies by company geologists (Carl Edmunds, Ken Rye, David Kuran) and re-



Source: MEMPR, Land Management and Policy Branch.

Figure 10. Mineral exploration expenditures in Northwestern British Columbia; 1982 - 1993.

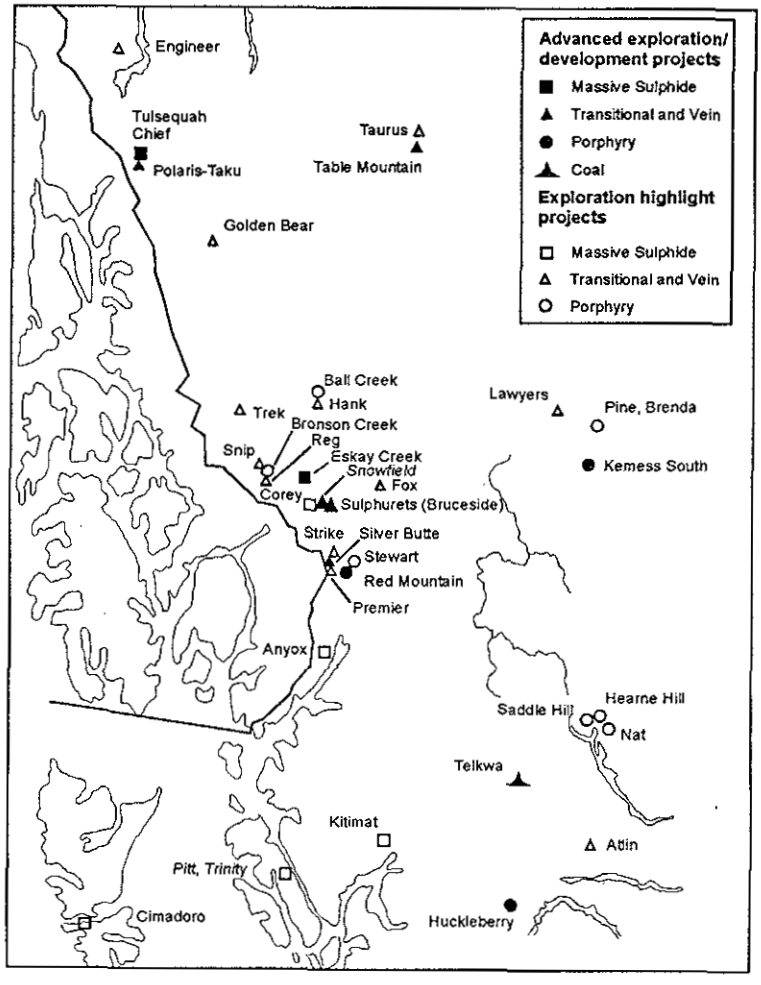


Figure 11. Major exploration projects - Northwestern Region.

searchers at The University of British Columbia, Mineral Deposit Research Unit (Peter Lewis, James Macdonald, Tina Roth, Roland Bartsch and others). Successful grassroots exploration on the Corey property by Ambergate Explorations Inc. and Kenrich Mining Corporation, and programs conducted by Homestake Canada Inc. and Canamera Geological Ltd. in the Eskay district can be attributed to confidence in applying an Eskay deposit model.

Finally, northwestern British Columbia has experienced significant exploration success during both 1992 and 1993 which spurred activity. Exploration successes include both established projects such as Red Mountain, Huckleberry, Golden Bear, Bruceside and Telkwa Coal, and grassroots to early stage projects such as Corey, Stewart and projects in the Babine district. These programs are discussed in more detail below; continued evaluation is expected and an active exploration season is anticipated in 1994.

Declaration of the Tatshenshini-Alsek Wilderness Park by the Province of British Columbia on June 22, 1993 alienated mineral claims, including the giant Windy Craggy copper deposit, from further exploration and development. Although compensation has been promised, this decision concerns all mineral explorationists who seek clear assurance of mineral title. Increased exploration activity in the Northwest has occurred despite this negative development.

In statistical terms, the level of 1993 exploration expenditure in northwestern British Columbia is set in historical context in Figure 10 (data have not been corrected for inflation). Thirty-two major projects that had expenditures that exceeded $100 000 in 1993, are summarized in Table 6 and locations are shown in Figure 11. Total exploration drilling increased to 114 610 metres from 68 077 metres in 1992. There were 175 Notices of Work representing 153 properties (many staged projects submit a number of notices). Gold was by far the most sought after commodity accounting for 67% of exploration spending on epithermal, shear-hosted and mesothermal veins, "porphyry gold" and Eskay-type targets. Copper-zinc volcanogenic massive sulphide deposits (with byproduct precious metals) accounted for 19%, porphyry copper(-gold) deposits for 11%, and coal and industrial minerals the remaining 3% of exploration expenditures. Data contained in this report are derived from property visits by the Regional Geologist,

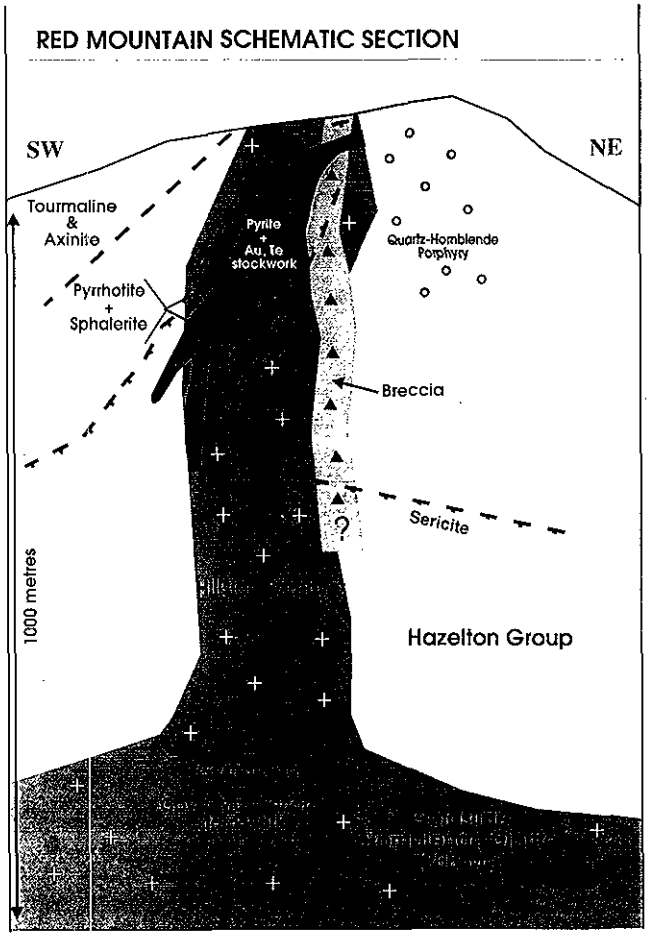


Figure 12. Red Mountain gold prospect, Marc zone schematic section.

news releases and other publications and, most significantly, from voluntary responses by explorationists to a survey, for which the writer is highly appreciative.

RED MOUNTAIN GOLD PROSPECT

At Red Mountain (Figure 12), announcement on February 16, 1993 of a geologic resource of 2.5 million tonnes grading 12.8 grams of gold per tonne was the culmination of a pivotal 1992 season that led to a $10 million underground development, surface and underground drilling program by Lac Minerals Ltd. in 1993. Objectives of the program were: to confirm interpretation and continuity of the AV zone by drilling on 100-metre sections; to evaluate the Marc zone by three underground crosscuts spaced 100 metres apart and by drilling on 25-metre sections; to evaluate grade continuity in the Marc zone by a variety of detailed sampling methods; to drill test other zones (GY, JW, Cambria East and the new 141 zone); to complete induced polarization coverage of Red Mountain and to clarify the regional geologic setting through a cooperative 1:50 000-scale mapping program with the Geological Survey of Canada. There were also objectives related to environmental studies, access road, tram line, geotechnical and metallurgical aspects of the project.

The gold zones at Red Mountain are related to a 200 Ma hornblende diorite stock intruded into Hazelton Group massive andesite tuff and overlying well-bedded siltstone, wacke and pebble conglomerate. A small body of hornblende diorite porphyry, about 250 metres across, is interpreted to be a high-level apophysis of the main stock. The Marc zone, which is understood best, is an area of fracturing and brecciation within and along the porphyry contact. Numerous pebble breccias imply explosive brecciation. Mineralization comprises disseminations, vein stockwork and breccia matrix of coarse-grained pyrite that is locally massive (Plates 2 and 3). Gold is present as microscopic native gold, electrum and tellurides. Lac Minerals' geologists have determined coarse pyrite to be the most reliable visual indication of gold grade. The Marc zone is steeply dipping, 15 to 30 metres wide, 250 metres long and 150 metres high, with a sigmoidal shape in cross-section, suggesting structural control to its emplacement. Geometry of the gold zones is complex but all appear to have a sigmoidal shape. There is a halo of sphalerite, pyrrhotite and strong sericite alteration to all ore zones. Pale green mica is prominent locally. Pervasive potassic feldspar alteration is present but its extent is unknown, but quartz is notable by its low abundance in the mineralized zones. Black chlorite(?) and carbonate are prominent on fractures in the Marc zone. A 1000-metre drill-hole probed the main intrusion below the gold zones and intersected weak porphyry copper-molybdenum mineralization, with chlorite and epidote alteration and gypsum-filled fractures (H. Smit, personal communication, 1993). The Red Mountain gold zones are interpreted to occur near the top of the sericite shell of this weak porphyry system. Tourmaline and fracture-controlled axinite occur above and peripheral to the gold-bearing zones.

Gold mineralization and geology at Red Mountain are comparable to the Porgera gold deposit in New Guinea. The Red Mountain deposit is associated with volatile-rich hornblende diorite emplaced into ductile strata in an island arc - continental margin, collisional tectonic setting (C. Greig, personal communication, 1993), analagous to the setting of the Porgera deposit. At Red Mountain and Porgera ductile deformation of weak, marine sedimentary rocks accomodated intrusive emplacement and suggests very early and high-level magmatism. At Porgera the intrusive rocks are alkalic, at Red Mountain petrochemistry is not available but some intrusive phases contain quartz phenocrysts. Both Red Mountain and Porgera are low-silica, high-sulphidation deposits; gold is associated with coarse pyrite, sphalerite (plus other base metal sulphides) and strong phyllic alteration. Both systems are characterized by hydrothermal breccias; auriferous zones are controlled by fracturing and intrusive contacts. Anhydrite (Porgera) or

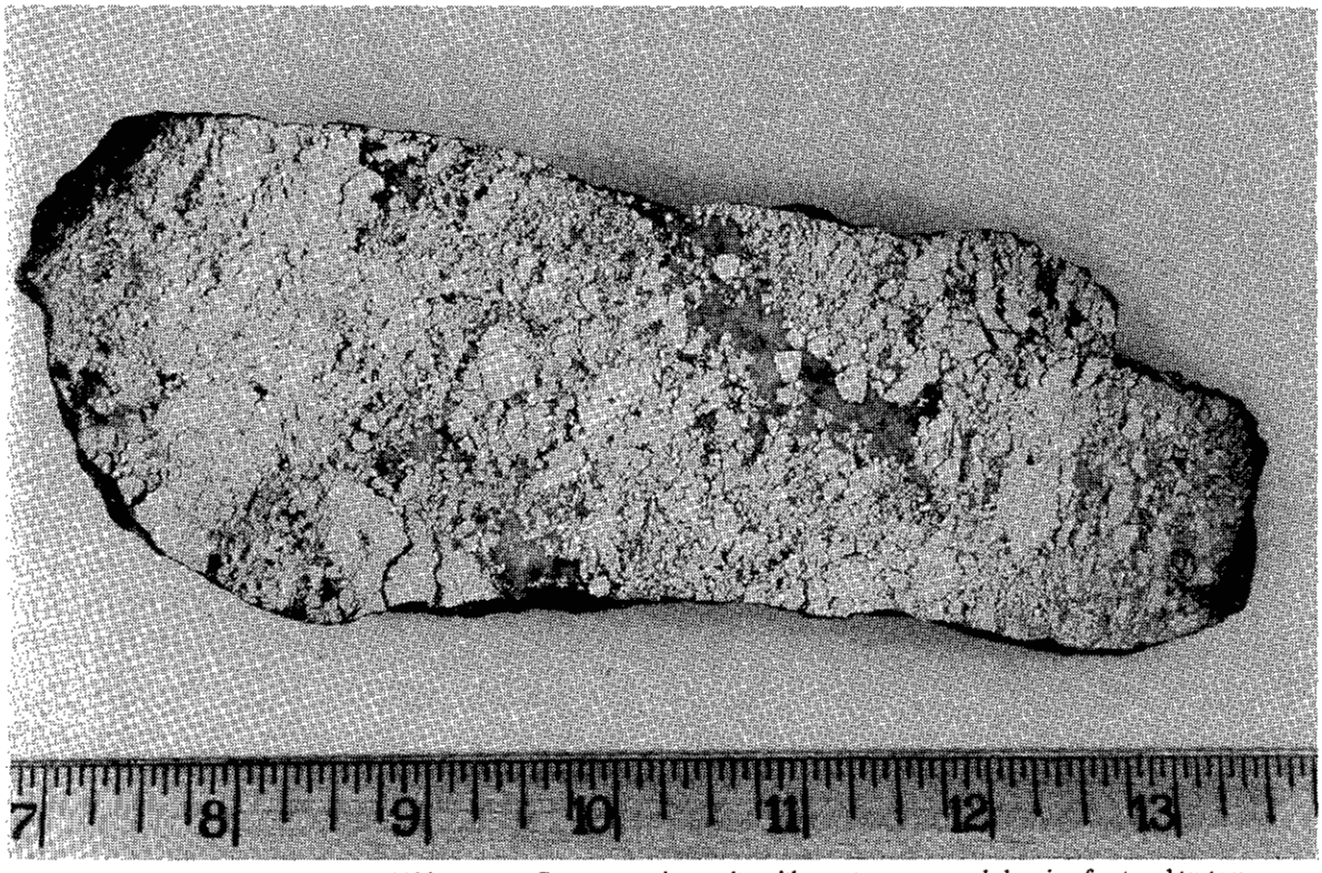


Plate 2. Red Mountain, Marc zone, 1100 crosscut. Coarse, massive pyrite with quartz gangue and showing fractured texture.

Plate 3. Red Mountain breccia on the northeast margin of the Marc zone. Angular grey to black siltstone fragments with heavily disseminated pyrite, pyrrhotite and sphalerite. Textures not apparent in the photograph indicate sphalerite and pyrrhotite are later than pyrite.

gypsum (Red Mountain) veining occurs at depth. Two significant differences are: gold recovery at Red Mountain is indicated to be good whereas more than 50% of Porgera's gold is refractory, and secondly, there is a late, volumetrically small but economically important bonanza-grade metallic gold - telluride - roscoelite vein breccia at Porgera. Validity of a Porgera analogy for Red Mountain will be disclosed by future exploration and research studies, but its exploration impact may be more immediate.

STEWART - ISKUT GOLD DISTRICT

The Stewart - Iskut gold district was the most active area in northwestern British Columbia. The **Bruceside** project operated by Newhawk Gold Mines Ltd was the second largest program after Red Mountain. The West zone, focus of most previous work, lies within a north-northwest-trending belt of gossans and strong alteration, 2 kilometres wide and 12 kilometres long, that contains at least 30 mineral occurrences. Zones explored in 1993 include SG, Maddux, Gossan Hill (Tommyknocker and PM structures) and Galena Hill (G structures) and are all characterized by en echelon to sinuous and braided, east to northeast-striking shear zones that are transverse to the overall north-northwest trend. The structures contain sericite, potassium feldspar and quartz stockworks and breccia with pyrite and variable tetrahedrite, sphalerite, galena and electrum. Drill intercepts up to 3 metres long and grading better than 35 grams gold per tonne give encouragement for continued exploration. The style of mineralization is similar to the upper levels of the Premier gold mine. Newhawk Gold Mines Ltd. also explored the **Snowfield** property, immediately north of Bruceside, to evaluate disseminated low-grade gold mineralization in the immense Snowfield gossan, and tetrahedrite-bearing quartz veins in the Josephine zone. The best drill intercept in the Josephine zone is 6.6 metres grading 8.74 grams per tonne gold and 723.7 grams per tonne silver.

At **Eskay Creek**, Homestake Canada Inc. continued its systematic exploration of the Eskay ore horizon by drilling geologic targets beneath argillite of the overlying Bowser Lake Group. Homestake also continued to build its database of Salmon River Formation mudstone horizons; the aim is to evaluate lateral geochemical dispersion in the contact mudstone (*e.g.* 21B deposit) and hangingwall mudstones (*e.g.* 21C deposit). Rhyolite/mudstone breccia, strikingly similar to the Eskay property, was discovered by geologists mapping the nearby **Corey** property for Kenrich Mining Corporation and Ambergate Explorations Inc. Follow-up prospecting yielded new gold occurrences that the companies expect to drill in 1994.

In the Bronson Creek area, Cominco Ltd. continued its systematic exploration of targets near the Snip gold mine, probably British Columbia's most successful operation in 1993. On the **Jim** claims , northwest of the Twin vein, drilling begun in 1992 continued in 1993, and to the southeast extensive geophysical surveys were conducted over the **Bronson** claims optioned from International Skyline Gold Corporation. However, the usefulness of these surveys is in doubt because orientation EM and UTEM surveys conducted over the Twin massive sulphide vein gave only weak responses. On **Johnny Mountain**, International Skyline uncovered excellent surface exposures of the Zephrin vein as part of its exploration program preparatory to reactivation of underground mining. Consultant David Rhys determined that the Zephrin, 16 and Discovery veins represent a single structure disrupted by faulting.

In the Stewart area, Westmin Resources Limited and Tenajon Resources Corporation drove the 130-metre Alimak raise from the 810-metre level of the **Silver Butte** (SB) workings to evaluate the Kansas and West Kansas zones. The objective is to supply Westmin's Premier gold mill with custom ore, as the Facecut zone at Silver Butte did in 1991. Kansas/West Kansas mineralization is characterized by erratic coarse gold in a vein stockwork and breccia zone containing quartz, calcite (with carbon stylolites), pyrite, sphalerite (zoned light to dark brown) and galena. Bulk samples were extracted from the raise and two short drifts, and processed at the Premier mill. Detailed drilling was also carried out in an effort to determine an overall gold grade. At the **Premier** mine, Westmin tested the intersection of the northeast ore-bearing structure with an inferred cross fault. Ore structures are interpreted by Westmin to be faults which delineate the margin of a volcanic basin.

Near Bob Quinn Lake, Homestake Canada Inc. drill tested a silicified horizon within an extensive quartz-clay-pyrite epithermal alteration zone on the **Hank** property and Colossal Resources explored a porphyry copper-gold target at **Ball Creek**. Near Stewart, Trev Corporation in a joint venture with Cameco Corporation, drilled the **Cornice Mountain** gold-sphalerite breccia zone, a Red Mountain gold target in Bear Pass. Finally, on the **Trek** property near Galore Creek, under option from Lorica Resources Ltd., Warner Ventures Ltd. drilled a shear-hosted pyrrhotite-chalcopyrite vein with moderate gold values.

COAST RANGE VOLCANOGENIC MASSIVE SULPHIDE PROJECTS

Redfern Resources Ltd. continued to explore historic producers in the Devonian-age **Tulsequah** massive sulphide camp. Geologic parameters and ore potential are comparable to the Myra Falls deposits on Vancouver Island. Most diamond drilling was directed towards confirmation of the Tulsequah Chief geologic reserve and to initial exploration of the **Big Bull** area. Minor drag folds at Big Bull indicate complex deformation, and regional mapping by Mitch Mihalnyuk of the British Columbia Geological Survey Branch suggests that Big Bull may be near the core of an isoclinal synform. Drilling at Big Bull yielded moderate grade mineralized intercepts. An extensive induced polarization survey outlined new drilling targets on the Tulsequah

property. Two large anomalies were tested by a total of four holes and intense silica-pyrite footwall alteration was intersected in both targets.

Near **Kitimat**, American Bullion Minerals Ltd. explored a 12-kilometre belt of Cu-Zn-Fe-Au-Ag-barite occurrences within "Kitselas" volcanic rocks, a presumed submarine facies of the Lower Jurassic Telkwa Formation. Although mineralization seen to date ranges from disseminated to skarn and vein style, the presence of altered quartz-phyric rhyolite confirms a volcanogenic massive sulphide environment. On **Pitt Island**, 70 kilometres south of Prince Rupert, Inco Limited drill tested a semimassive copper-zinc sulphide horizon 1.7 kilometres long and related to the Pyrite Creek lineament. Mineralization is characterized by tectonically milled gangue clasts, referred to as durchbewegung texture. The sulphide horizon is contained within a metamorphic roof pendant, 200 metres wide, of uncertain age in Coast Range granite. At the **Anyox** deposit, TVI Copper Inc. sought to confirm an open-pit copper reserve in the stockwork feeder zone of the previously mined Hidden Creek deposit and explored geophysical targets near the Jurassic mafic volcanic/argillite contact.

PORPHYRY COPPER(-GOLD) EXPLORATION

New Canamin Resources Ltd. discovery of the East zone at the **Huckleberry** copper prospect early in 1993 led to a major drilling program which still has not fully delineated the new deposit. Mineralization is related to the margins of two biotite-quartz-feldspar porphyry stocks, dated at 82 Ma and correlated with the Bulkley Plutonic Suite. The alteration zone and pyrite halo surrounding the stocks are developed primarily in Hazelton Group volcanic rocks and underlie an area at least 4 kilometres long by 1 kilometre wide, that trends east-west and is mainly overburden covered. Total reserves now stand at 100 million tonnes grading 0.56% copper and drilling is scheduled to resume early in 1994.

Exploration in the Babine porphyry district focused near three established prospects and on two new targets. Booker Gold Explorations Limited explored small but high copper-grade breccias within low-grade porphyry mineralization at **Hearne Hill**, east of the subeconomic Morrison deposit. The Chapman zone breccia is comprised of biotite feldspar porphyry clasts exhibiting high-temperature porphyry-style alteration, partially cemented by a coarse-grained, low-temperature assemblage of chalcopy-

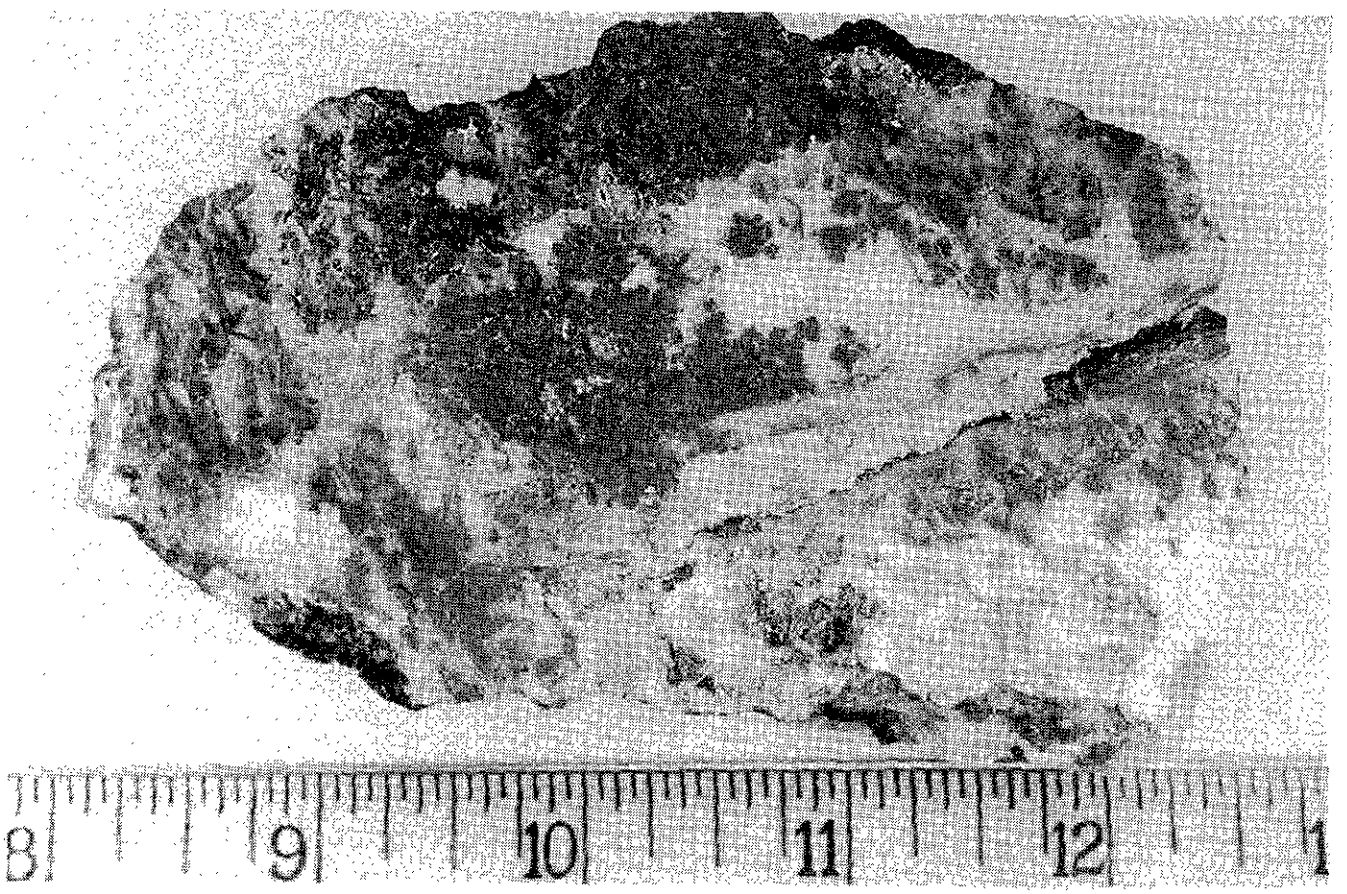


Plate 4. Engineer mine, a pocket of roscoelite (black) is laced with several percent electrum and surrounded by quartz. Note relict calcite rhombs.

rite, pyrite and dolomite. Phelps Dodge Corporation of Canada Limited drilled the **Saddle Hill** property west of Morrison Lake and Cominco Ltd. worked on the **Lennac** prospect near the town of Granisle. Noranda Exploration Company Limited explored for the source of ore-grade glacial float on the **Babs** property southeast of Granisle mine and on the **Nat** claims northeast of Bell Copper mine. Both of these recent discoveries resulted from prospecting recently logged areas.

GOLD IN FAR NORTHWESTERN BRITISH COLUMBIA

Gold mineralization at **Golden Bear** mine occurs where Permian limestone is juxtaposed with Triassic mafic volcanic rocks within a braided fault zone known as the Ophir break. Drilling in 1992 discovered a new gold zone 300 metres below current mining, but at mill elevation, which is now referred to as the Grizzly zone. Initial drill intercepts were ore grade but only 1.5 metres wide. One of three holes drilled in 1993 produced an ore-grade intercept with an estimated true thickness of 7 to 8 metres. North American Metals Corp. decided to drive an adit to explore the zone from underground and the portal was collared in December, 1993. A new gold discovery was made late in the year in the Fleece Bowl area, 2 kilometres north of the mine. The Kodiak zone is related to a footwall splay of the Ophir break and early indications are that it offers much greater widths than previous gold zones, up to 30 metres, and is nonrefractory, implying lower treatment costs.

Activity in the Cassiar camp increased substantially late in 1993. Mesothermal gold veins are spatially related to a regional thrust fault which superposes argillite on listwanite-altered serpentinite and metabasalt (M. Ball, personal communication, 1993). Drilling during mid-summer by Cusac Industries Ltd. confirmed approximately 620 000 grams of gold in the West Bain vein and a decline was collared by early November. In addition, a much larger gold reserve in the Michelle high-grade zone may also be exploited because high water flow from the Cusac 10-level has abated. On the nearby **Taurus** property, Hera Resources Inc. is strongly encouraged by its 1993 trenching and drilling program, and plans to resume exploration very early in 1994. Work to date has outlined 436 000 tonnes grading 7.2 grams per tonne gold (George Cross Newsletter, Dec. 16, 1993). At the **Cassiar** asbestos mine, Black Hills Minerals, Minpro and Cliff Resources are negotiating with the Crown-appointed receiver to rehabilitate the mine.

At the **Engineer** gold mine west of Atlin, Ampex Mining continued its underground investigation of a series of epithermal veins which contain sporadic bonanza gold. Native gold, and electrum with roscoelite (a rare vanadium mica), are associated with fine-grained late quartz which replaced early calcite rhombs (Plate 4), a classic epithermal texture. Ampex has located a number of high-grade shoots and proposes to install a 50 tonne per day mill in 1994.

COAL

Manalta Coal Ltd completed its second exploration program on Cretaceous thermal coal deposits near **Telkwa**. Coal quality parameters are considered good, except for sulphur content which is marginally high. The new Tenas deposit, drilled in 1993, is on a lower seam which historically contains low sulphur, and offers the possibility of a blended product for the export market. Development of the **Mount Klappan** metallurgical coal prospect will not proceed in the foreseeable future, causing Gulf Canada Resources Limited to reclaim the pilot plant and other site infrastructure.

OPERATING MINES

Snip mine, operated by Cominco Ltd, continued to perform admireably with mine-site gold production cost of approximately US$150 per ounce. Mine exploration has maintained reserves equivalent to five more years at the current production rate of 440 tonnes per day. Through the first three years of mining, mill-head grades have been maintained at 29 to 32 grams gold per tonne and in mid-1994 the mine will surpass the half million ounces milestone.

Golden Bear mine is operated by North American Metals Corp., which is managed by Wheaton River Minerals Ltd. Reserves in the Main Bear deposit are estimated at 165 000 tonnes at 20 to 23 grams per tonne gold (Northern Miner, Oct. 25, 1993) and production cost is US$270 per ounce. Poor ground conditions provide an on-going challenge for the underground mine to maintain continuity of ore production to the mill/roaster complex at a rate of 400 tonnes per day.

The open pit ore stockpile at **Premier** mine was depleted in the spring of 1993 and the 2200 tonne per day mill continued to operate at reduced capacity based on ore supplied by underground mining. Underground ore is derived from the lower levels of the historic Silbak Premier mine (940 and 1070 levels) and from caved stopes on the upper levels accessed from the Premier open pit. Ore production has increased progressively from 190 tonnes per day in January 1993 to 635 tonnes per day by year end. Premier enters 1994 with plans to develop new underground ore sources on Silbak Premier 4-level, giving some assurance of a minimum two-year mine life.

Equity Silver mine operated at 1180 tonnes per day during 1993 with ore supplied from a decline off the North pit. The economic performance of open-stope retreat underground mining was reduced by excessive dilution and lower than anticipated gold recovery. Exploration by Equity Silver Mines on the adjacent Allin Creek property was directed to an advanced argillic alteration zone with abundant pyrite and associated copper, silver and gold-bearing float, but was unsuccessful. Equity Silver mine, once Canada's largest silver producer, ceased mining operations on January

23, 1994. The mine produced 22 860 tonnes of silver, 17.53 tonnes of gold and 808 300 tonnes of copper since production began in October 1980.

The shutdown of Cheni Gold Mine's **Lawyers** mine and mill continued through 1993. Exploration in 1993, for bonanza structures like the Phoenix vein that was discovered and mined in 1992, did not locate sufficient ore to warrant re-opening the mine.

PLACER MINING

There were 97 Notices of Work on placer properties in northwest British Columbia in 1993, with the majority, 46 operators, concentrated in the historic Atlin camp. Ko-Ken Mining conducts the largest placer mining operation in the camp, on Otter Creek, moving approximately 250 000 cubic metres of gravel and employing up to 30 people. The *Cassiar - Dease Lake camp is a secondary focus of placer* mining activity.

CENTRAL REGION

By E.L. Faulkner, P. Geo.
Regional Geologist, Prince George

HIGHLIGHTS

- Expenditures in the district down 42% from 1992.
- Mineral Notices of Work and major exploration projects both down sharply from 1992.
- Strong interest in base metals sedex deposits.
- Mine construction at the QR gold deposit planned to start in 1994.
- Land-use and the Protected Area Strategy (PAS) continue be the priority concern in the region.

SUMMARY

Exploration activity and expenditures in the region continued to decrease in 1993. Exploration expenditure, at $4.6 million was down 42% from 1992 (Figure 13). Mineral Notices of Work, at 101, were down 31% from 1992 (Figure 14). Placer Notices of Work, however, at 443, were up 44% from 1992).

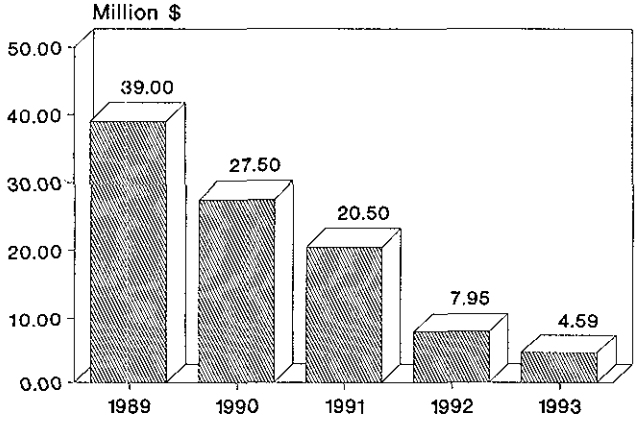


Figure 13. Exploration expenditures - Central Region, 1989-1993.

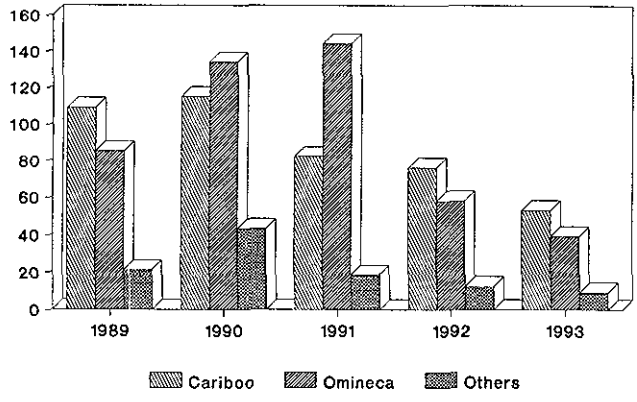


Figure 14. Notices of work - Central Region, 1989-1993.

Several major companies cut their spending in the district substantially or completely, and there were few junior companies willing or able to undertake more than minimum programs. The number of companies that submitted Notices of Work and later cut back or cancelled their programs was also much higher than usual. On a more positive note, the decline in activity and expenditures was less than had been indicated at the beginning of the year, with some majors particularly active in base metal sedex and epithermal precious metal exploration. There was a cautious feeling that the low point in the exploration cycle had been reached or had passed.

The Mount Milligan copper-gold deposit received a Mine Development Certificate late in the year, and Kinross Gold Corporation, which assumed control of the QR gold deposit, converted the Approval-in-Principal granted earlier to a Mine Development Certificate, with mine construction planned for 1994.

EXPLORATION

Although precious metals in all types of deposits again dominated exploration targets in 1993, there were some significant changes in emphasis. The locations of significant exploration projects are shown on Figure 15. Interest in porphyry copper-gold targets declined again, but this was offset by an increase in interest in base metal sedex exploration.

In the sedex projects, Cominco Ltd. had the largest programs in the Ingenika area at their **Par** and **Cygnet** properties, while Teck Exploration Limited and Minnova Inc. led the search in the Muskwa and Gataga ranges. Results reported from the Ingenika were generally mixed to poor, but results reported from both the Muskwa and Gataga areas were generally encouraging, and some major follow-up drilling programs are planned for 1994. Teck, for example, reported a number of good intersections at the **Driftpile** property, including 5.2 metres grading 20.7% zinc and 8.3% lead.

In the northern Quesnel Trough, El Condor Resources Ltd. drilled for possible faulted extensions to the main **South Kemess** deposit and continued with work toward a Mine Development Certificate. On other porphyry targets, Noranda Exploration Company Limited reported some encouraging results from a percussion drilling program at the **Kliyul Creek** property, including 20 metres grading 2.1 grams per tonne gold and 0.51% copper. Romulus Resources Ltd also reported encouraging intersections from

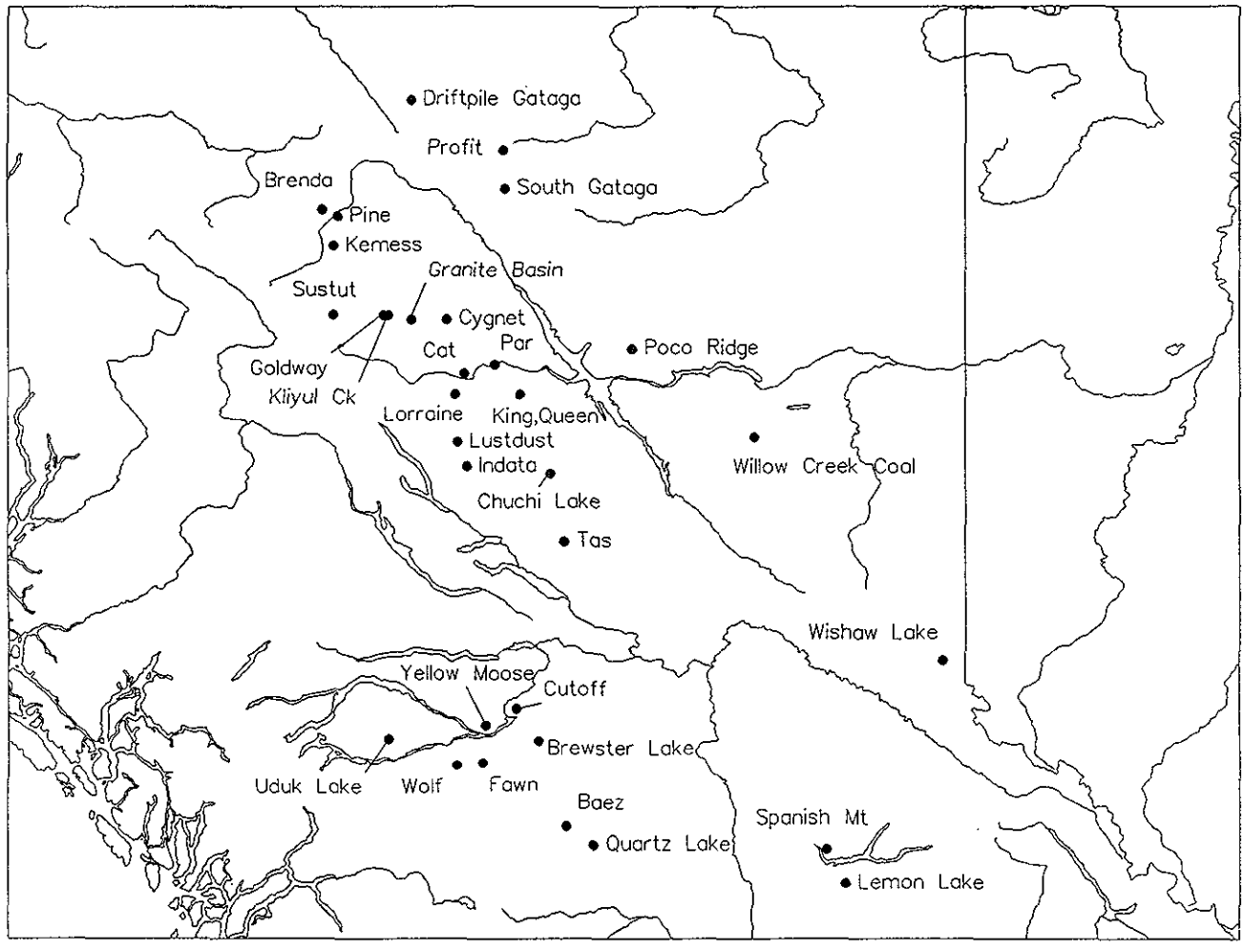


Figure 15. Major exploration projects - Central Region.

drilling at the **Pine** and **Brenda** properties and Canasil Resources Inc. reported some very good gold and silver assays from a trenching program on porphyry-related shear zones at its **Granite Basin** property.

Further south, the owners of the **Tas** property extracted a 100-tonne bulk sample from the porphyry-related pyrite-pyrrhotite shears of the Ridge zone. Processing of the sample revealed ore-grade gold content that was much more consistent than indicated by trench assays.

Interest in epithermal and porphyry-related targets on the Fraser Plateau continued despite a history of generally mixed results, with both Ootsa Lake Group and Hazelton Group volcanic hosts receiving attention. Cogema Canada Ltd. worked to identify drill targets on a number of properties and Minnova Inc. drilled the **Wolf** property. A number of other companies and individuals carried out smaller programs. True to form, most results reported from the plateau were mixed, but interest in this area is expected to remain strong.

Elsewhere in the district, Alpha Gold Corporation continued work on the **Lustdust** property, west of the Pinchi fault, with another drilling program, and again reported several intersections with good zinc, gold and silver values in replacement veins. In the basal phyllite of the Quesnel Trough east of Likely, Cogema extracted and processed a bulk sample from the **Spanish Mountain** property. Here nugget effect problems have made it difficult to project grades and tonnages from trench samples.

Industrial minerals and dimension stone continued to attract modest attention in 1993, but most programs were low budget and limited to access preparation and testing. Late in the year a protocol agreement was signed between the Ministry of Environment, Lands and Parks and the Ministry of Energy, Mines and Petroleum Resources that should clear up some ambiguities and problems relating the tenure of industrial minerals and stone that have presented problems for some developers.

Placer operations continued to be affected by the flat gold price. The decrease in mechanized operations and the increase in smaller recreational or hobby operations continued, although the total number of operations was up sharply. Uncertainty over land-use decisions in the historic Cariboo continue to create major concern for many operators.

For the first time in almost a decade there was some exploration on a coal deposit other than at an established mining operation, as Globaltex Industries Inc. reactivated

the **Willow Creek** coal deposit with some trenching and sampling; a major drilling and sampling program is planned for 1994. Globaltex is working toward putting the property into production.

LAND USE

It was a very busy year in land-use issues and the Protected Area Strategy. In the Cariboo Forest Region, the CORE roundtable failed to reach a consensus, continuing the uncertainty over the location of possible protected areas and other land-use restrictions.

In the Prince George Forest Region, which is not a CORE region, land and resource management plans (LRMP's) are in progress in six of the seven forest districts. These plans will develop landuse and management recommendations, but the plans are not expected to be completed until late in 1994.

Despite the land-use planning activity that is in progress throughout the region, uncertainties over the land base of the province that will be available to exploration and mining, and related issues such as the location of new protected areas (parks), the restrictions that might apply to exploration and mining in areas subject to vaguely defined "special management" and as yet unresolved compensation issues continue to be seen by industry as negative factors discouraging exploration.

MINE DEVELOPMENT REVIEW IN BRIEF

Cirque (Pb, Zn, Ag): Late in 1993 a major impediment to the possible development of this property was removed with the purchase of the property from the receiver by a consortium of companies including Cominco Ltd. and Teck Corporation. A review of the mining plan for which the Mine Development Certificate was issued is in progress, but a production decision will require improved base metal prices.

Kemess (Cu, Au): El Condor Resources Ltd. continued its work toward a Mine Development Certificate.

Mount Milligan (Au, Cu): Placer Dome Inc. received a Mine Development Certificate for the property, but has announced no further plans to either develop it or dispose of its interest. Most of the exploration areas have been reclaimed.

Mount Polley (Cu, Au): Imperial Metals Corporation continued to seek financing or a joint venture partner to put the property into production. Imperial Metals and Gibraltar Mines Ltd have recently announced that they are exploring the possibility of processing Mount Polley ore at the Gibraltar mine plant.

QR (Au): Following a reorganization, control of the property passed to Kinross Gold Corporation. Changes to the mining plan which was granted Approval-in-Principal were approved and a Mine Development Certificate was issued. The revised mining plan calls for simultaneous open pit and underground mining with an increase in milling rate. Construction is planned to start in 1994.

OPERATING MINES

With the exception of the Gibraltar mine, the regions' four mines continued to operate at near capacity. In the northeast coal district, a planned increase in output from the Bullmoose mine was largely offset by a decrease in production from the Quintette mine.

Late in the year Gibraltar closed all mining and milling operations except for the solvent extraction - electrowinning plant, to limit losses due to the decreasing price of copper. A feasibility study is in progress to determine if operating costs can be lowered significantly by increasing the mining rate and milling capacity.

OUTLOOK

The outlook for 1994 and beyond continues to be uncertain. The number of exploration projects in the region this year is expected to be close to the 1993 total, but the dollar value is expected to be modestly higher. Bright spots in an otherwise difficult year are expected to be one or more major drilling programs on base metal sedex properties in the Gataga and Muskwa ranges, and the start of construction at the QR mine.

SOUTH-CENTRAL REGION

By R.E. Meyers, P. Geo.
Regional Manager - Kamloops

Exploration activity for 1993 in south-central British Columbia decreased by about 33% from 1992 levels. The estimated value of exploration investment totaled $10.2 million, compared with $15.14 million in 1992. The continuous decline in expenditures over the past five years is illustrated by Figure 16 and has resulted from a number of factors, including depressed base metal prices, competition from outside jurisdictions and the impact of land planning initiatives on the industry's incentive to explore in the region.

The majority of exploration projects (Figure 17) were in the Kamloops, Clinton, Similkameen and Vernon Mining Divisions. The Similkameen and Clinton divisions received the largest share of exploration expenditures (Figure 18), due primarily to activities at the Elk gold project, near Merritt, and the Fish Lake porphyry copper-gold project in the Taseko Lakes area. These two projects have had significant impact on the distribution of expenditures over the past two years. Other areas, such as the Kamloops Division, where investment has previously been high, have experienced major reductions over the same period.

At year-end the number of metal mines operating in the region had shrunk to three (Highland Valley Copper, Nickel Plate and Goldstream). The Similco copper-gold mine operated by Princeton Mining Corporation was forced to close on November 30th, 1993 and production cutbacks, or layoff notices were in effect at intervals during the year at two other operations.

HIGHLIGHTS OF MAJOR PROJECTS

The primary exploration targets in South-central British Columbia continued to be precious metal veins, copper-gold porphyries and massive sulphide deposits. Strong gold prices and comparatively weaker copper prices placed exploration for vein deposits ahead of porphyry targets, both in the number of projects and the value of exploration investment.

The major exploration projects are listed in Table 6 and highlights of some of the larger programs are outlined below. The locations of significant exploration projects are shown on Figure 19.

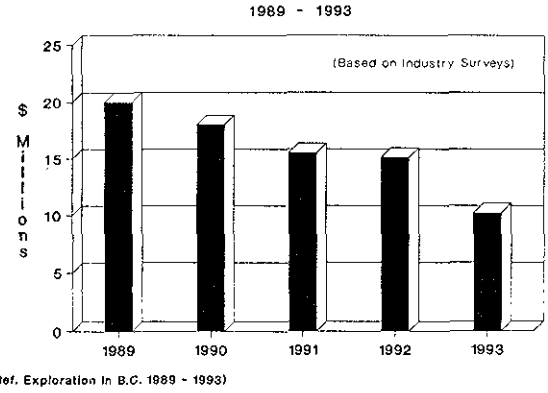


Figure 16. Exploration expenditures, South-central Region.

PRECIOUS METAL VEIN DEPOSITS

The most significant gold-silver vein project was operated by Fairfield Minerals Ltd. on the **Elk** property, where advanced exploration work continued on the Siwash North

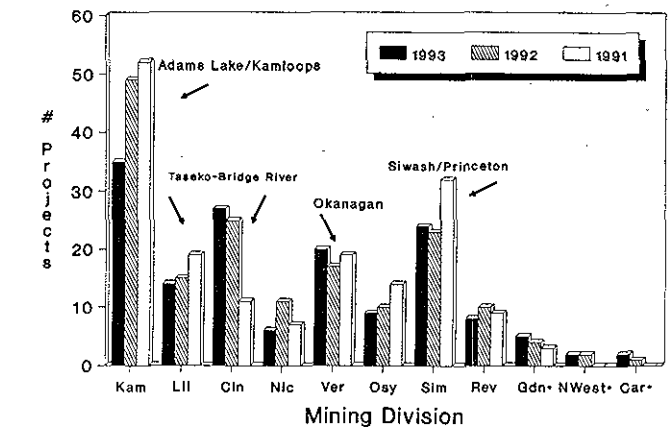


Figure 17. Exploration projects in the South-central Region, by Mining Division.

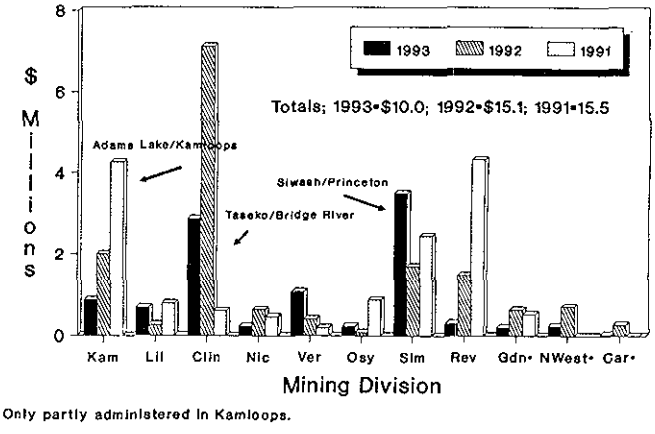


Figure 18. Mineral exploration expenditures, South-central Region, 1991-1993, by Mining Division.

gold zone. In 1993, Fairfield shipped approximately 2000 tonnes of gold ore to the Asarco smelter in Helena, Montana. Combined with 1992 work, the company has extracted about 3840 tonnes of a 10 000-tonne bulk sampling program. Ore mined in 1992 was shipped to the Horne smelter in Quebec. The 1993 program included expanded development of the open pit, and a 500-metre exploration decline to approximately 50 metres vertical depth on the south-dipping vein system. The company expects to continue development in both areas during 1994 and has indicated intentions to submit a pre-application for a Mine Development Certificate early in 1994.

Several other precious metal vein properties received major exploration efforts that focused primarily on underground drilling, sampling and rehabilitation work. At the **Wayside** property, near Gold Bridge, Wayside Gold Mines Ltd. completed underground drilling on several sections of the vein system, with moderately encouraging results. Elsewhere in the Bridge River area, Avino Mines and Resources Ltd., in joint venture with Bralorne-Pioneer Gold Mines Ltd., carried out underground rehabilitation and sampling, as well as extensive surface trenching at the Bralorne and King mines. The company filed a prospectus with the Mine Review and Permitting Branch in 1992 to return the mine to production, however, difficulty in raising capital has slowed advancement of the project.

In the North Okanagan region, Quinto Mining Corporation continued work on the **Lumby** (Chaput) gold-graphite property. Test work is planned to evaluate the feasibility of producing graphite and possibly sericite as industrial mineral commodities, with gold as a byproduct. The property was explored for its gold potential by Quinto in 1986-88 and also covers a past producing lead-zinc-silver deposit. At the Brett gold property, on Whiteman Creek, west of Vernon, Liquid Gold Resources Ltd. carried out surface drilling and additional trenching on the Main Shear, Bonanza and RW zones, in anticipation of an underground development and bulk sampling program in 1994. The program was directed to confirming results on the two gold zones previously explored by the Corona Corporation/Huntington Resources Ltd. joint venture in 1988-89.

Interest has also been regenerated at the **Blackdome** gold mine in the southern Chilcotin. An investment group, #75 Ventures Ltd., reopened several adits and carried out limited property rehabilitation. The operators intend to reopen the mine in 1994 under the name Blackdome Gold Corporation.

PORPHYRY DEPOSITS

A moderately strong exploration effort was directed toward porphyry copper targets in the region during 1993. With only three deposits of the type remaining in production in the province at year end, these and similar projects

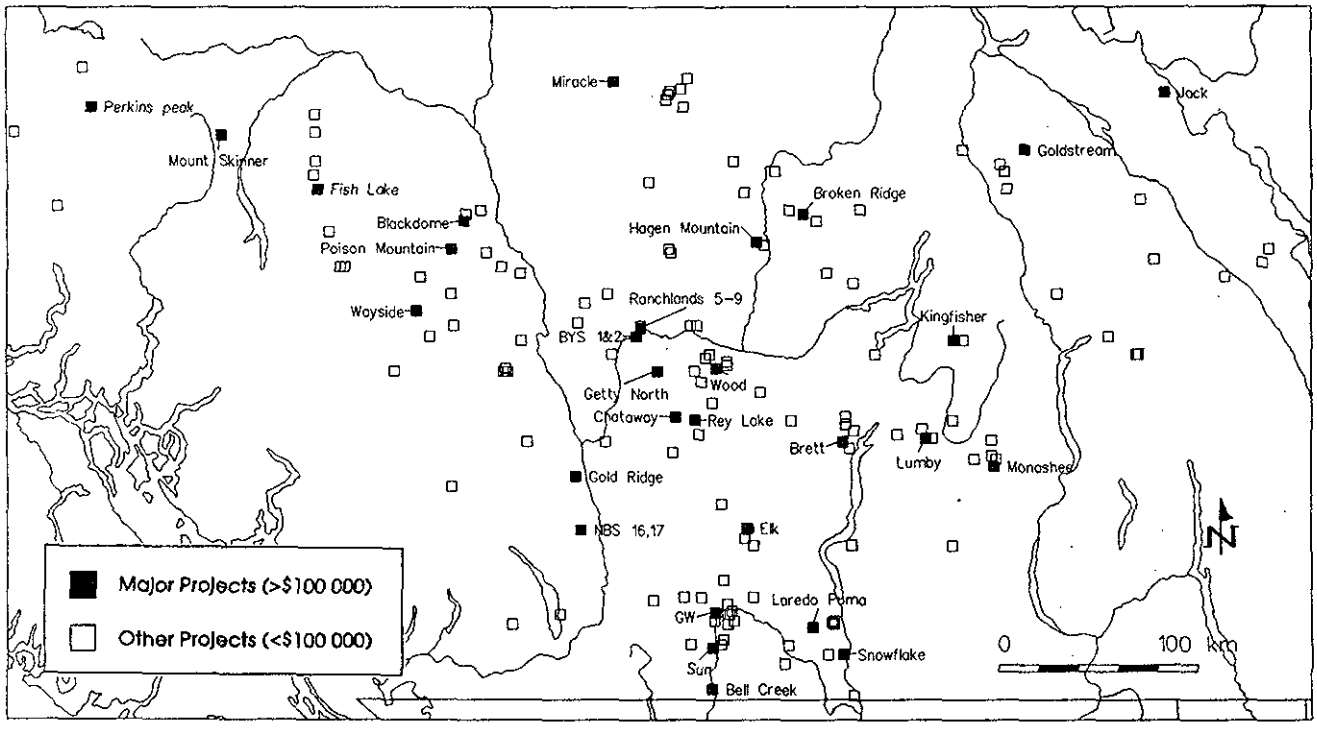


Figure 19. Major exploration projects - South-central Region.

are significant for the future of porphyry copper mining in British Columbia.

Following a $7 million program on the Fish Lake deposit in 1992, Taseko Mines Limited continued with a modest drilling program in 1993, to acquire additional geotechnical information. Prefeasibility work was also continued and the company submitted a pre-application for a Mine Development Certificate during the year. Taseko has also engaged in consultation with the public, environmental groups, First Nations and government agencies over the past two years. Preliminary mineable reserves are estimated to be in the order of 870 million tonnes grading 0.23% copper and 0.43 gram per tonne gold.

In the southern Cariboo region Regional Resources Ltd., in association with GWR Resources Ltd., continued with extensive exploratory work on the **Lac La Hache** porphyry-skarn project. Work in 1992 and 1993 has identified a number of porphyry copper-gold and copper-iron-gold skarn systems that hold significant potential (Miracle-Murphy, Peach Lake, Spout Lake). A newly discovered magnetite-copper deposit has a reported drill-indicated resource of 544 200 tonnes grading 1.8% copper, 49% iron and 0.17 gram per tonne gold.

North of the Bridge River district, Bethlehem Resource Corporation completed a drilling program on the **Poison Mountain** copper-molybdenum-gold deposit. This property was explored in the 1950-60 period and, more recently, was drilled by Lac Minerals Ltd. in 1987.

In the central part of the region Aucumo Resources Ltd. drilled approximately 4000 metres on the **Chataway** copper-molybdenum property in the Guichon Creek batholith, southeast of the Highmont mine. Elsewhere in the Highland Valley area, Getty Copper Corporation drilled a similar porphyry target on the **Getty North** property (Krain area), north of the Bethlehem mine. This property has been explored recently for its oxide copper SX-EW potential. To the southeast, within the central Nicola volcanic belt, Hera Resources Ltd. completed geophysical surveys and drilling on the **Rey Lake** porphyry copper-molybdenum and skarn targets, north of Swakum Mountain.

MASSIVE SULPHIDES

Relatively few massive sulphide targets were explored in the region during 1993. At the **Goldstream** mine, Bethlehem Resource Corporation explored the lower Paleozoic Index Formation, east and west of the main deposit. Although results were inconclusive, the project is expected to continue. Drilling in 1991 intersected substantial sulphide thicknesses down-dip from the deposit and the operators continue to be encouraged that there is additional tonnage potential in the area. During 1993 the Geological Survey Branch initiated a regional mapping program in the northern Selkirk Mountains to assess and promote the potential for massive sulphide deposits, with initial primary focus on the Goldstream area.

In the Similkameen River region, just east of Manning Park, Westmin Resources Limited completed an extensive surface program on the **Bell Creek** property. The property covers a small massive copper-zinc-barite-pyrite lens known as the Red Star occurrence, which has characteristics of Kuroko deposits.

INDUSTRIAL MINERALS

Exploration interest in industrial minerals continued throughout 1993, with particular emphasis on zeolites. Zeacan Products Ltd. drilled and sampled the **GW** and **Sun** properties south of Princeton and Mountain Minerals Ltd. continued percussion drilling and bulk sampling on the **Ranchlands** properties east of Cache Creek. Both companies continue to carry out analytical work, test marketing and product development on the materials.

On other projects, Poplin-Pagu Exploration Ltd. continued work on the **Kingfisher** marble property northeast of Vernon. In the Fraser Canyon area, Cromlech Ltd. extracted a bulk sample of silica-feldspar sand from the **NBS** deposit and Highland Talc Minerals Ltd. bulk sampled the **Gold Ridge** talc deposit. At the **Hagen Mountain** feldspar property, near Barriere, newly formed B.C. Feldspar Corporation completed pre-development stripping, and engineering and geological studies.

OPERATING MINES

A summary of highlights at operating mines in the region is presented in Table 7. The downturn in copper prices has had major impacts on operations; one mine closed and production cutbacks or layoffs took place at two other operations. At year-end there were only three metal mines continuing production in South-central British Columbia.

Highland Valley Copper: Production continued throughout the year at 122 000 tonnes of ore per day. Low metal prices and increased costs forced the company to eliminate 65 jobs in a restructuring program. At year-end labour-management negotiations were well under way, with many major issues resolved. The mine has approximately 14 years' reserves remaining.

Nickel Plate: Operations continued at 3500 tonnes of ore per day throughout the year. Expansion of the North pit began during the year and will provide production to 1997.

Goldstream: With the exception of a short interruption of production in May, mining continued at about 1150 tonnes per day throughout the year. Development of down-dip portions of the orebody progressed slowly and ongoing exploration was focused along strike from the main orebody. Approximately 5500 tonnes of high-grade gold ore from the Tillicum Mountain deposit was custom milled at the Goldstream concentrator.

TABLE 7

SOUTH-CENTRAL BRITISH COLUMBIA OPERATING MINES SUMMARY

HIGHLAND VALLEY COPPER
- Continued operation @ 130 kt of ore per day.
- Cutbacks - loss of 65 jobs.
- Approx. 14 yrs mine life remaining.

GOLDSTREAM
- Exploration of mine stratigraphy along strike.
- Brief production shutdown in May 93.
- *Custom milled Tillicum gold* ore - 5500 t.

CRAIGMONT
- Magnetite tailings recovery.
- New plant completed spring 93.
- To produce 60 000 t/ year for coal industry.

MOBERLY SILICA
- Lwr Paleozoic quartzite mined.
- Silica for Okanagan wine industry.

NICKEL PLATE
- North pit expanded to supply production to 1997.
- Stronger gold prices improve forecasts.
- Production @ 3500 t/day.

SIMILCO (Copper Mtn.)
- Operations suspended Nov 30 1993 due to weak Cu prices.
- Limited surface exploration carried out.
- Major impact on community of Princeton.

PARSON
- Capacity 50 kt/year.
- Maintain approx 10-yr reserve.
- On-going expln in Parson - Columbia River area.

CANDORADO
- Mine Development Certificate to mine additional tailings at Headley.

Similco: Following an extended period of weak copper prices, Princeton Mining Corporation (Similco Mines Ltd.) permanently suspended operations at the Similco mine as of November 30, 1993. The closure follows attempts earlier in the year by Similco and the British Columbia Job Protection Commission to develop an economic plan to defer costs during the period of depressed prices. Unfortunately, a workable plan was not achieved. The company also carried out extensive geological and geophysical exploration during the year, but did not proceed with an anticipated drilling program.

Craigmont: This magnetite recovery operation continued to supply magnetite to the coal industry in 1993. A newly constructed plant began operations early in the year, processing stockpiled magnetite from earlier mining operations. Ultimate plans are to re-process magnetite-rich portions of the Craigmont tailings. The operation also has potential for future custom milling.

At other operations, Mountain Minerals Ltd. continued production at the Parson barite mine and the Moberly silica mine near Golden. Parson barite is used as industrial fillers and in drilling mud. The Moberly silica mine and plant supplies silica to the Lavington glass plant, which produces glass bottle products for the Okanagan wine industry. The Candorado gold-tailings leach-recovery project at Hedley received a Mine Development Certificate to expand operations to include tailings deposits from the former Mascot gold mine. The region's two major limestone operations continued in full production throughout the year. Lime for cement and other industrial uses is produced by Lafarge Canada Inc. at Kamloops and by Continental Lime Ltd. at Pavilion Lake.

KOOTENAY REGION

By H.P. Wilton, P. Eng.
Regional Geologist, Cranbrook

TRENDS

By most indicators, the level of exploration activity in the Kootenay Region showed a cautious upturn in 1993, reversing a downward trend that started in 1990. Comparative indicators are tabulated in Table 8.

The most dramatic reversal occurred in the number of mineral claim units recorded (+22% in contrast to - 36% the previous year). Part of the increase, however, can be directly attributed to speculative staking for diamonds throughout the length of the Rocky Mountains and in the northern Purcell Mountains. The total number of Notices of Work filed was 181, up 9% from the 1992 total. The number of "major" projects (those with significant drilling or relatively large budgets) was up 14% from the corresponding figure in 1992. However, the total amount of drilling (excluding exploration drilling at the operating coal mines) was down by 3% from 1992, indicating that, although there were more drilling programs, the budgets were generally smaller.

TABLE 8
COMPARATIVE INDICATORS OF LEVEL OF EXPLORATION ACTIVITY

Notices of Work:	1990 - 253
	1991 - 197 (-22%)
	1992 - 166 (-16%)
	1993 - 181 (+ 9%)
Major Projects:1990 - 55:	1991 - 39 (-29%)
	1992 - 29 (-26%)
	1993 - 33 (+14%)
Metres Drilled:	1990 - 60,253
(Excluding Coal Projects)	1991 - 38,040 (39%)
	1992 - 28,000 (-26%)
	1993 - 27,206 (-3%)
Mineral Claim Units	1990 - 11,022
Recorded:	1991 - 8,218 (-25%)
	1992 - 5,294 (-36%)
	1993 - 6,475 (+22%)
Estimated on the Ground	
Expenditure (All Projects):	1991 - $12 Million
	1992 - $7.1 Million (-41%)
	1993 - $8.3 Million (+17%)

The estimated total on-the-ground expenditure for all projects in the region in 1993 is $8.3 million. This figure includes actual expenditure figures reported or published by the operators of most of the major projects and also a rough estimate by the author for the remaining major and all of the minor projects, based on the amount and type of work known or assumed to have been done. It therefore represents only a rough approximation of the amount of money spent. Nevertheless, it suggests an increase of 17% over a similarly derived figure of $7.1 million for 1992. This is a significant improvement because the 1992 estimate had represented a 41% decrease from 1991. The figure of $8.3 million includes an estimated $3.0 million for on-property exploration by the coal mines, leaving a total of $5.3 million estimated for exploration at metal and industrial mineral properties.

EXPLORATION HIGHLIGHTS

Table 6 gives details of those major projects in the region which included drilling in excess of 900 metres, underground exploration or budgets in excess of $100 000. Figure 20 shows the locations of all projects referred to in the text or listed in the table.

METALS

The **Fors** project of Consolidated Ramrod Gold Corporation and Chapleau Resources, centred immediately west of Moyie Lake in the Purcell anticlinorium, saw the largest total expenditure of all the exploration projects in the Kootenay Region in 1993. Diamond drilling totalled 7172 metres in 18 holes and has been almost continuous since the discovery of about 3 metres of weakly banded massive sulphides in late 1992. The objective of the project is to locate an orebody like the Sullivan lead-zinc-silver sedex deposit in the Proterozoic Aldridge Formation of the Purcell Supergroup. Although the discovery intersection of massive sulphides occurs high in the Middle Aldridge stratigraphy, attention has been focused on the Sullivan horizon, the stratigraphic contact between the Lower and Middle Aldridge at which the Sullivan orebody occurs. Two separate hydrothermal vents are now believed to occur within the area being tested and two of the recent long holes are reported to have intersected over 90 metres of zinc-bearing tour-

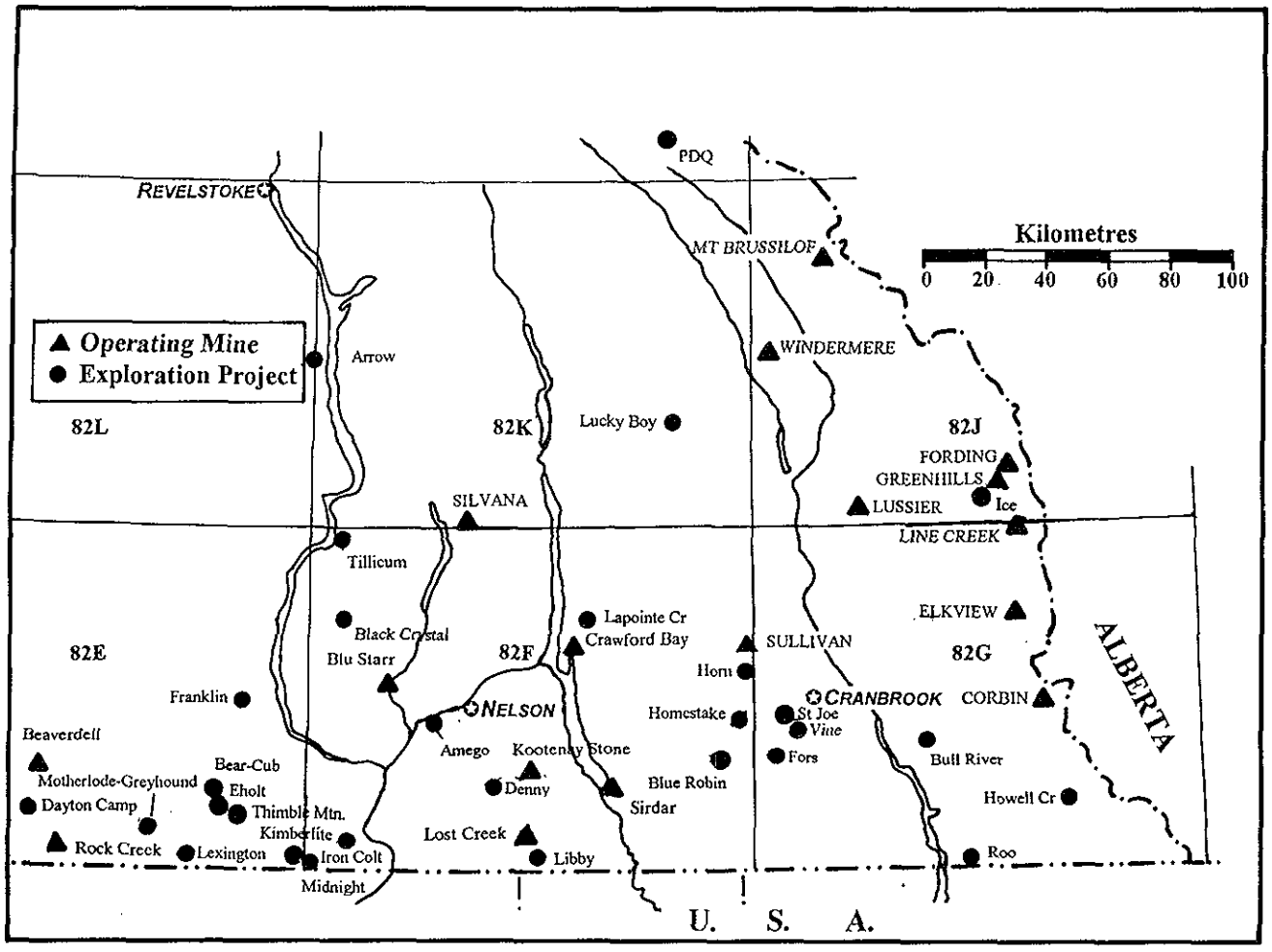


Figure 20. Major exploration projects and operating mines - Kootenay Region.

malinite at the Sullivan horizon. Sulphide-rich tourmalinized breccia, numerous thin, conformable sulphide bands and virtually all of the alteration types indicative of a Sullivan-like sedex environment have been found over a large area and over a thick stratigraphic interval above and below the Sullivan horizon. North and east of Moyie Lake and the Fors property, Consolidated Ramrod also drilled four long holes on the **Vine** property where previous drilling intersected 4 metres of massive sulphide east of the outcropping Vine massive sulphide vein and at a depth of 750 metres. This intersection is now believed to be parallel to bedding and may be the edge of a bedded deposit. The adjoining Fors and Vine properties together remain the most promising area yet seen for discovery of the long-sought and badly needed successor to the Sullivan orebody.

Other properties drilled with Sullivan-style targets were the **St. Joe** where Consolidated Ramrod drilled four relatively shallow holes in the Middle Aldridge and the **Horn** property south of St. Mary Lake where Metall Mining Corporation drilled two long holes to investigate the setting of an intraformational conglomerate very similar in character to a fragmental rock which underlies the Sullivan orebody at Kimberley.

Another large-budget drilling program for Consolidated Ramrod was the **Blue Robin** project located around Richmond Lake between Kamma and Perry creeks. The work, which included 20 trenches and 14 diamond-drill holes totaling over 1600 metres, explored several occurrences of northeast-trending, silicified shear zones and quartz vein systems containing gold. The results were sufficiently encouraging that additional work is planned for early in 1994. At the **Homestake** property on Perry Creek, Chapleau Resources completed nine short holes, also exploring a gold-bearing silicified fault system. The best intersection was reported to be 1 metre at 10.3 grams per tonne gold.

The adjoining **Howell Creek** and **Flathead** properties of Phelps Dodge Corporation comprise a low-grade, bulk-tonnage gold prospect located in the Flathead area southeast of Fernie. Extensive auriferous pyrite mineralization is associated with a complex of Cretaceous alkali trachyte and syenite sills, dikes, small plutons and intrusive breccias. The intrusive rocks have penetrated and extensively altered a complexly faulted package of sedimentary rocks ranging in age from Proterozoic to Triassic. Minor purple fluorite, galena, sphalerite, barite and copper sulphides also occur,

mainly associated with late-stage silicification and quartz veining. Typical gold values are in the range of 0.3 to 0.8 gram per tonne. Work in 1993 included six diamond-drill holes totalling 890 metres at Howell Creek, and trenching on the Flathead claims.

The **Roo** property, tested by Noranda with a modest drilling program in 1993, is a sandstone-hosted copper-cobalt-silver prospect located on Phillips Creek near the Roosville border crossing. The main stratiform mineralization consists of abundant pyrite and lesser chalcopyrite and chalcocite disseminated within arkosic sandstone of the Sheppard Formation, a mixed clastic-carbonate unit of the Helikian Purcell Supergroup. The host sandstones overlie amygdaloidal basalt flows and volcaniclastics of the Nicol Creek Formation. Previous sampling returned grades up to 1.93% copper and 9.0 grams per tonne silver.

A very promising copper-gold prospect is the **Lexington-Lonestar** property of Britannia Gold Corporation which straddles the Canada/U.S. border south of Greenwood. It incorporates several previous producers of the historic Greenwood camp, representing a variety of mineralization types. It also includes the large Lonestar pit on the American side of the border which still contains a reserve of at least 18 million tonnes of low-grade copper-gold mineralization. Britannia Gold's exploration is focused on a northwest-trending "dacite"-serpentinite contact more than 2 kilometres long, extending from the Lonestar pit to the old No. 7 mine area. At about the mid-point of the trend, the Main Zone deposit contains a proven mineable reserve of 131 500 tonnes grading 9.6 grams per tonne gold and 1.45% copper. Main zone mineralization consists of massive magnetite and massive sulphides, both carrying gold and copper values and concentrated along a gently dipping contact between serpentinite (locally listwanitic) and "dacite", an altered assemblage of intermediate to mafic volcanics. The mineralization is believed to have replaced rocks on both sides of a thrust or detachment fault within an ophiolitic complex. Drilling in 1993 totalled 1862 metres in thirteen holes in the Main Zone area, the nearby TG81 zone and a newly discovered deposit of gold-bearing massive magnetite, the Golden Cache zone, in the No. 7 mine area.

Four other properties in the Greenwood camp were explored for copper-gold skarn-hosted mineralization, three of them with modest diamond drilling programs. The joint venture of Orvana Minerals Corporation and Placer Dome Inc. drilled five short holes intersecting significant gold mineralization in skarn within Knob Hill cherts, between the past-producing **Motherlode** and **Greyhound** mines. The same joint venture drilled at the **Eholt** property, encountering extensive skarn alteration with minor gold and copper in Triassic metavolcanic rocks, and completed a geological assessment at **Thimble Mountain** north of Grand Forks. Teck Exploration Ltd. drilled six holes on the **Bear** and **Cub** claims north of Eholt, also looking for mineralized skarn in Knob Hill rocks.

Other significant projects in the Kootenay Region in 1993 include the **Dayton Camp** northwest of Rock Creek where Winslow Gold and Northwind Ventures drilled ten shallow rotary holes testing a series of skarn-altered faults containing low-grade gold with minor copper, and the **Arrow** property west of Upper Arrow Lake where Teck Exploration Ltd. completed nine diamond-drill holes to evaluate lead-zinc sulphide mineralization east of and on the same stratigraphic horizon as the Big Ledge sedex deposit. At the **Franklin** camp north of Grand Forks, Sway Resources Inc. completed 21 short, surface diamond-drill holes and 15 underground holes exploring several interconnected zones of base and precious metal vein and replacement mineralization.

At **Tillicum Mountain**, a gold skarn deposit in Rossland Group volcanic and sedimentary rocks south of Nakusp, the joint venture of Bethlehem Resources Corporation and Goldnev Resources Inc. mined a bulk sample of 5500 tonnes averaging about 24.3 grams per tonne gold from the small but relatively high grade Heino Money zone. The ore was processed at Bethlehem's Goldstream mill north of Revelstoke. Limited underground drilling failed to confirm any additional ore in the Heino Money zone and the property has been returned to its owner, Columbia Gold Mines. The nearby East Ridge zone, which contains a drill-indicated reserve of 440 000 tonnes grading 10.3 grams per tonne gold, was not explored further in 1993.

At Rossland, International Silver Ridge Resources and Vangold Resources Inc. completed an additional 67 metres of raising in erratic but locally high-grade gold mineralization on the main LeRoi vein structure at the **Iron Colt** claim. The companies are presently improving access to the underground working area in preparation for removal of a 4500-tonne bulk sample. Consolidated Ramrod Gold is carrying out surface diamond drilling and underground channel sampling at the **Midnight** mine near Rossland where high-grade gold mineralization is associated with serpentinite in altered listric thrust faults.

South of Nelson, Cameco Corporation completed a modest drilling program testing for gold in Rossland Group volcanics on the **Denny** property, and McMahon Resources is drilling the **Amego** property on Fortynine Creek to locate the source of gold-rich, silicified breccia float reported many years ago in the creek. On the **Libby** property south of Salmo, Consolidated Ramrod Gold drilled a total of 833 metres in nine diamond-drill holes to test for high-grade zinc mineralization in the Nelway Formation and drilling is continuing on the adjacent Lead Hill property in Washington. The target mineralization is believed to be stratigraphically equivalent to the Yellowhead ore horizon in the Metaline mining district about 24 kilometres south of the Canadian border.

At the **Bull River** mine, southeast of Cranbrook, R.H. Stanfield and Associates continued their ongoing program of drilling long holes from surface to improve the known reserves of gold-copper ore beneath the previous surface pit workings. Mineralization consists of massive, gold-rich chalcopyrite in a system of east-trending quartz-ferrocarbonate veins. Amerlin Exploration Services Ltd. completed a series of short drill holes to test vein occurrences containing gold, silver, lead and zinc at the **Lucky Boy** property on Toby Creek, and Barkhor Resources Inc. mounted a small drilling operation to test similar mineralization on the **Lapointe Creek** property at Rose Pass, east of Crawford Bay.

INDUSTRIAL MINERALS

Much of the increase in claim staking in 1993, particularly in the East Kootenays, can be attributed to the sudden interest in diamonds which has gripped many parts of Canada and the world, including neighbouring Alberta. All of the known, and many newly discovered, ultramafic plutons, dikes, and all types of diatreme-like structures in the Rocky Mountain belt and northern Purcells have been staked and are undergoing grassroots sampling and prospecting. The most ambitious diamond project in the Kootenays was the work by Consolidated Ramrod Gold on its large **Ice** property located along the west side of Elk Valley immediately west of Elkford. The Ice claims surround the Cross diatreme on Crossing Creek, British Columbia's only confirmed true kimberlite . The company carried out extensive stream sediment and soil sampling and a 400-kilometre airborne geophysical survey. Several strong chromium-nickel soil anomalies as well as abundant G9 and eclogitic pyrope garnets, chromite and ilmenite in stream sediments are reported. There are unconfirmed reports from prospectors of diamonds and abundant indicator minerals having been found in placer deposits in the **Wildhorse River** area northeast of Cranbrook. In the West Kootenays, Sway Resources has reported finding indicator minerals associated with a brecciated harzburgite intrusion on the **Kimberlite** claims west of Rossland.

In the Slocan Valley, two local prospectors are continuing to recover abundant corundum crystals from the Valhalla gneisses on the **Blu Starr** claims at Passmore. They shape and polish the crystals into cabochons and market them through jewellery stores in Nelson as blue-grey, semi-transparent "Kootenay star sapphires". They and others are continuing to find additional occurrences of gem quality sapphires, titanite, aquamarine, smoky quartz, garnet and other minerals throughout the southern Valhalla Mountains. At the head of Hoder Creek, close to the boundary of Valhalla Park, Mr. Paul Schiller of Vancouver has discovered and sampled an occurrence of graphite in marble on the **Black Crystal** property. He hopes to drill it in 1994.

On the **PDQ** claim at the head of Moose Creek, south of Golden, Magtite Minerals carried out a ground penetrating radar survey to more accurately measure the total mineable reserves of a talus deposit of massive magnetite. A small excavator was mobilized to the property by helicopter and four small bulk samples were flown out for testing.

Industrial minerals are becoming more attractive to a greater number of prospectors and companies in the Kootenays as worthwhile targets for exploration. Fluorite, magnesite, barite, gypsum and talc, as well as the gemstones mentioned earlier, are all being sought. There is also increasing interest in the acquisition of properties with dimension stone (marble and granite), slate and flagstone potential.

PLACER MINING

Placer testing and mining activity continued in 1993 in the Kootenays but at a slowly diminishing rate. The greatest concentration of active placer properties is in the **Wildhorse River** watershed where unconfirmed reports of diamonds and diamond indicator minerals having been found in the gravels have added new excitement to the oldest placer gold camp in the Kootenays. Other placer gold activity of note occurred in the Perry Creek, Moyie River, Pend D'Oreille River and Rock Creek areas.

PRODUCING MINES

COAL

Some stability returned to the southeast coalfields in 1993 with all five mines back in operation by year-end, following a disastrous year in 1992 when the three largest mines were closed temporarily due to strike, lockout or bankruptcy.

The **Fording River** operations of Fording Coal Limited were in full production through 1993 and completed over 16 000 metres of rotary exploration drilling distributed among several existing and potential pit sites on the property. At its **Greenhills** mine, Fording completed over 20 000 metres of rotary exploration and geotechnical drilling. The mine was back in regular production by mid-year with a new mining plan which will eventually see the seven separate pits, operated previously by Westar, amalgamated into one large producing pit using larger equipment and a reduced workforce.

At the **Elkview** (formerly Balmer) mine, Elkview Coal Corporation, a subsidiary of Teck Corporation, resumed production in May at a current production rate of 3 million tonnes per year. A total of 66 rotary holes were drilled on the property in 1993 for various purposes including exploration, development and geotechnical studies. At the **Line Creek** mine of Line Creek Resources, an aggressive ongoing exploration program continued in several areas on the property and included close to 300 rotary-drill holes and

over 2000 metres of diamond drilling. There was no exploration at the **Byron Creek** mine of Corbin Creek Resources but production continued through the year an annual rate of about 1 million tonnes of thermal coal.

METALS

The **Sullivan** lead-zinc-silver mine of Cominco Ltd. was closed for a period of 11 weeks in mid-year as an "inventory control" measure but otherwise continued to produce at a rate of over 1 million tonnes per year through 1993. Remaining ore reserves are sufficient for eight to nine more years of production. The **Silvana** silver-lead-zinc mine of Treminco Resources Limited at Sandon closed at the end of March 1993 pending improved lead and zinc prices. No significant on-property exploration is reported at either mine.

SOUTHWESTERN REGION

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INTRODUCTION

The Southwestern Region is synonymous with the Southwestern District, as defined in Exploration in British Columbia 1992. It encompasses the Queen Charlotte Islands, Vancouver and the off-shore islands and the Coast Mountains southeast of Bella Coola (Figure 21).

The change in nomenclature reflects a change in the structure of the Mineral Resources Division of the Ministry of Energy, Mines and Petroleum Resources. The Regional Geology Section of the ministry has been transfered to a newly formed, regionally oriented, Land Management and Policy Branch.

The Regional Geology office for the Southwestern Region is in Vancouver. It monitors exploration and other geoscience activity and acts as a source of data and technical analysis for industry, government and the public at large.

HIGHLIGHTS

- Westmin Resources Limited lost production as a result of an industrial dispute at its Myra Falls operation.
- Exploration for industrial and other nonmetallic minerals increased significantly.
- Monteith Bay Resources Limited brought its "geyserite" (silica) deposit into the Mine Development Assessment Process.
- The provincial government announced a compromise land-use decision reopening sections of the Clayoquot Sound "study area" to mineral exploraton.

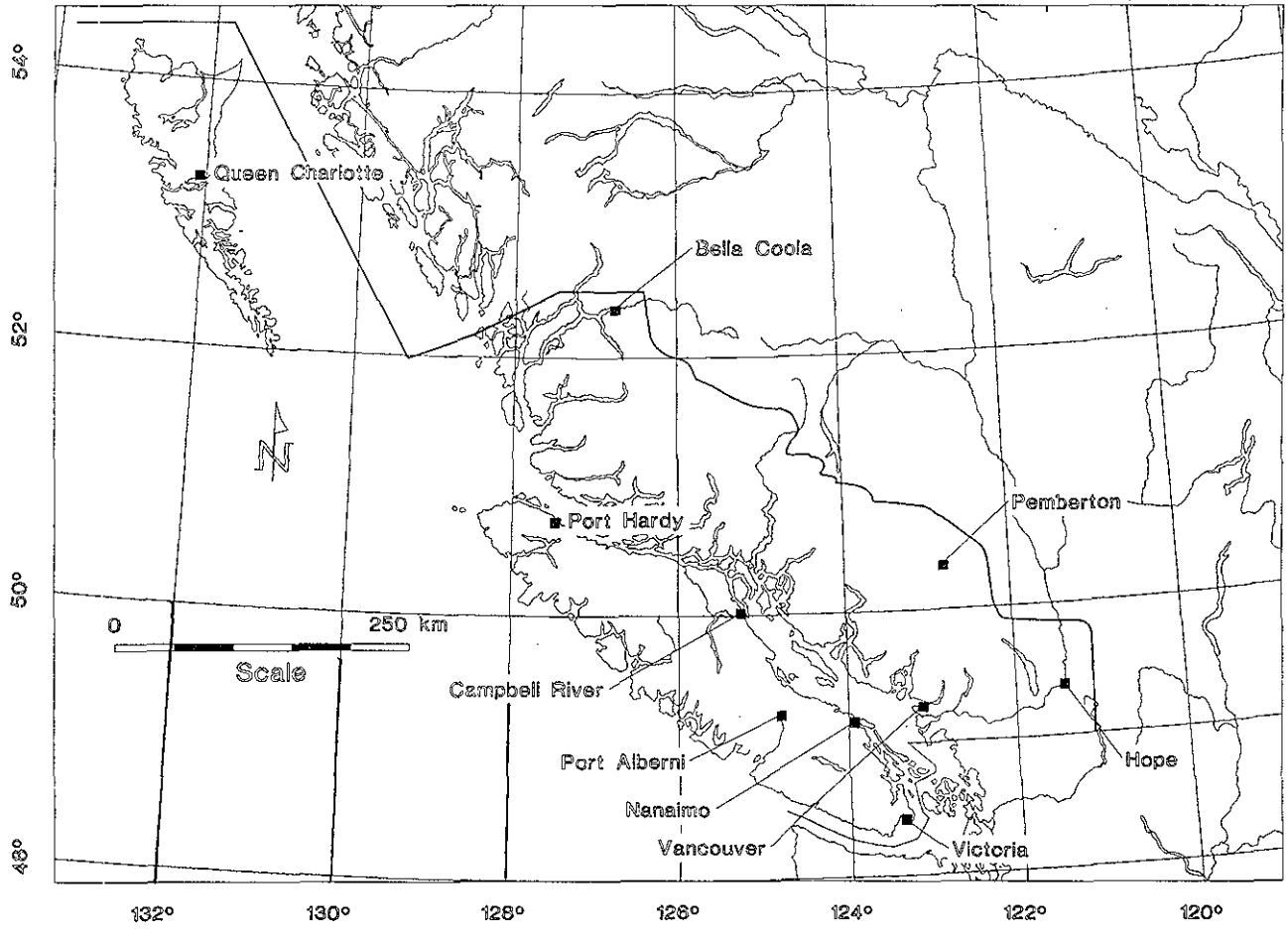

Figure 21. Southwest Region, location map.

- The Ministry of Energy, Mines and Petroleum Resources responded to provincial land-use initiatives such as the Commission on Resources and Enviroment (CORE) and the Protected Area Strategy (PAS).

EXPLORATION TRENDS

The mining and exploration industries in British Columbia had another difficult year in 1993. Exploration decreased throughout the province and dropped off markedly in the Southwestern Region. There was a major reduction in mid-stage exploration that was only partially offset by a significant increase in interest in small-scale, bulk sample extraction. The interest applied both to metallic and nonmetallic mineral properties. Four of the region's major projects involved the extraction of bulk samples. There were 85 Notice of Work applications filed for mineral properties in 1993, up marginally from 83 in 1992 and down from 88 in 1991 and 137 in 1990. The figure for 1993 is not exactly comparable to those of previous years as fewer small exploration projects will have gone unreported. The ministry now requires that a claim holder file an application before costs can be applied for assessment credit. The majority of notices relate to small programs with low exploration budgets.

The total amount invested in exploration in the region is estimated to be $5.0 million; down from $8.5 million in 1992 and $9.5 million in 1991. The figure for 1993 reflects both a general decline in expenditure, particularly on metal exploration projects, and a specific reduction in expenditure at Westmin Resources Limited's **Myra Falls** operation. Had the company been in a position to carry out its intended exploration program, the drop would have been far less severe.

Sixteen "major" projects, arbitrarily defined as incurring costs in excess of $100 000, account for 86% of the overall estimated expenditure. They include ten metallic mineral projects that account for 36%; four nonmetallic or industial mineral projects that account for 37% and two mine-site projects that account for 13% of the total.

The major metallic mineral projects were focused on volcanogenic massive sulphide (4); shear and stockwork quartz-vein hosted gold (4); porphyry copper-gold (2) and skarn copper-gold (2) deposits. The major nonmetallic projects were aimed at coal, silica, pumice and dimension-stone marble. Ten projects were on Vancouver Island, four on the Mainland and one each on Texada and Moresby islands.

The intermediate and small exploration programs carried out in the Southwestern Region were largely directed at locating high-grade vein or skarn deposits or towards defining dimension stone or other industrial mineral deposits.

The level of grassroots exploration activity in the region is difficult to assess. It was probably low, although at least two major and several junior companies were active on Vancouver Island and there were some announcements of new mineral discoveries.

OPERATING MINES AND QUARRIES

The three operating mines on Vancouver Island experienced considerable difficulty in light of current commodity prices.

Myra Falls Operation: Westmin Resources Limited owns and operates a nominal 4000 tonnes per day underground mine at Myra Falls, at the south end of Buttle Lake, on Vancouver Island. The company reported a loss of $0.28 per share in the first quarter and announced its intention to close the Lynx mine. The announcement triggered a dispute that precipitated a lock-out on 24th April. Attempts to mediate a resolution failed and the operation remained shut down at year's end. Prior to closure, it produced approximately 400 000 tonnes of ore containing 6.8 million kilograms of copper; 7900 tonnes of zinc; 5555 kilograms of silver and 269 000 grams of gold.

The lockout caused Westmin Resources to scale back exploration at Myra Falls. The company had intended to drive the 18-level drift over the Battle zone, complete definition drilling, and ramp down into the deposit. Because of the dispute, it was only able to complete 100 metres of underground development, ten underground diamond-drill holes for an aggregate length of 3200 metres, two surface diamond-drill holes for an aggregate length of 1000 metres and a down-hole geophysical survey.

Non-union staff completed rehabilitation and maintenance work at the mine-site and undertook the first stage of the definition drilling program. The company is currently drilling the southeastern end of the Battle zone on 15-metre sections.

The results indicate that the zone is comprised of a series of discrete sulphide lenses that formed in fault-controlled linear basins flanking a central, synvolcanic horst. The basins formed after an extensive period of intermediate volcanism. They filled with sulphide, chert and felsic volcanic strata. The sulphide in the Top lens, on the northeast side of the horst, is comprised of a lower unit of fine-grained pyrite and chalcopyrite and an upper unit rich in sphalerite. It contains very little detrital sediment.

The Battle zone is faulted and the faults are locally intruded by andesitic dikes. Holes drilled in the South Trough lens area, on the southwest side of the horst, intersected an epigenetic gold-rich pyrite-vein stockwork in the footwall of one of the dikes.

Westmin Resources had some exploration success early in the year, prior to the lockout. The company drilled two surface holes in the Thelwood Creek area and intersected encouraging stratigraphy. It also drilled an underground hole north of the North Down Drop fault, northwest of the Gap zone, and encountered H-W horizon stratigraphy at a shallower depth than had been expected.

The critical stratigraphy is above the level of the lowest mine workings and any ore lenses within it should be readily accessible for development.

The company resumed small-scale production from the H-W mine in October. It hopes to resume development and ramp down into the Battle zone as soon as circumstances allow.

Island Copper Operation: BHP Minerals (Canada) Ltd. owns and operates a nominal 50 000 tonne per day open-pit porphyry copper mine near Port Hardy, at the north end of Vancouver Island. The mine processed 15 162 433 tonnes of ore in the first ten months of the year and recovered 58 million kilograms of copper, 1.3 million kilograms of molybdenum, 1.8 million grams of gold and 16 million grams of silver in 1993.

The mine has been in operation since 1971 and is nearing the end of its productive life. As of May, 1993 it had a mineable reserve of 59.9 million tonnes grading 0.36% copper and 0.017% molybdenum, sufficient for another two or three years of production. In 1993, BHP Minerals conducted several exploration programs designed to locate additional near-surface ore in the immediate vicinity of the mine. The company drilled 33 diamond-drill holes for an aggregate length 5566 metres.

BHP Minerals owns, and Jordex Resources Inc. operates, the **Hushamu** copper-gold deposit northwest of Island Copper. There was no field program in 1993 but Jordex completed a preliminary technical and economic analysis and announced a proven and probable reserve of 173 237 000 tonnes grading 0.27% copper, 0.009% molybdenum and 0.34 gram per tonne gold. The companies hope to establish the feasibility of transporting ore from Hushamu to the mill at Island Copper. The deposit could extend the life of the concentrator after it exhausts its own reserves.

Quinsam Coal Operation: Hillsborough Resources Ltd. owns, and Brinco Coal Mining Corporation operates, a thermal coal deposit at Quinsam Lake, west of Campbell River, on Vancouver Island. In 1992, Brinco Coal announced its intention to restructure the operation. It plans to move from open-pit to underground production and increase output to around a million tonnes of clean coal per year. It produced approximately 500 000 tonnes in 1993.

Brinco currently produces coal from two different areas. Coal from underground workings in the 2N reserve block is blended with coal from the 3S open-pit section of the 2S/3S reserve block in a single wash-plant adjacent to the 2N portal.

In 1993, Brinco started to develop a second entry in the 2N block. It is nearly complete and the company expects to transfer the two "continuous miners" working in the 2N block to the new development sometime in 1994. The company also expects to start work on a new portal in the floor of the old 2S pit. This development would allow a single continuous miner to produce from underground reserves in the 2S/3S block. The coal will offset production lost when the 3S pit is shut down next spring.

The company has started to build a second wash-plant adjacent to the new portal in the 2N area. The new plant will increase the mine's capacity and enable it to expand production.

Texada Island Limestone Quarries: Holnam West Materials Limited and Ash Grove Cement Company maintained production from their respective limestone quarry operations at the north end of Texada Island. The two companies ship approximately 4.5 million tonnes of chemical, cement and agricultural grade limestone throughout the Pacific Northwest.

MINE DEVELOPMENT SUBMISSIONS

There are three properties in the Southwestern Region in the Mine Development Assessment process. Two entered the process in 1992 and a third filed a preliminary prospectus in 1993.

Red Dog: Crew Natural Resources Ltd. has received "terms of reference" for continuation of its application to develop the Red Dog porphyry copper deposit, near Holberg at the north end of Vancouver Island. The development proposal is predicated on the company reaching a custom milling agreement with BHP Minerals (Canada) Ltd.

Sumas Sodaspar: Quality Mineral and Supply Inc. is still within the assessment process. It has not yet received "terms of reference" to enable it to continue with its application to develop a sodaspar deposit near the top of Sumas Mountain.

Monteith Bay Geyserite: Monteith Bay Resources Ltd. owns a "geyserite" silica deposit on Easy Inlet, at the north end of Vancouver Island. The company has identified a reserve of appoximately 2.0 million tonnes of pure (hot-spring derived) "geyserite" silica within a large, high-level, pyrophyllite alteration zone. It drilled 14 diamond-drill holes, for an aggregate length of 550 metres and shipped a 9000-tonne bulk sample to the Tilbury cement plant in Delta.

The company has applied for permission to quarry, crush, stockpile and ship between 70 000 and 100 000 tonnes of silica per year.

EXPLORATION ACTIVITY

VANCOUVER AND TEXADA ISLANDS

There were several large and small exploration projects carried out on Vancouver Island. Some of the more significant projects were on-going from previous years (Madhat, Teeta Creek, Vananda Gold etc.). Some were reactivations of old projects (Debbie, Rimy mine, Vananda limestone

etc.) and some were new ventures (Tsolum River coal). The projects (Figure 22) include:

Leo D'Or Marble: Leo D'Or Mining Inc. has a permit to extract a 3000-tonne bulk sample of pure white marble from a dimension stone quarry site at the north end of Bonanza Lake, on Vancouver Island. The company is using a saw to cut 18 to 25-tonne blocks from three production benches. It had cut approximately 35 blocks by year's end. They are to be shipped to Asia and eastern Canada for slabbing for dimension stone.

Madhat: Orvana Minerals Corporation continued to explore for porphyry copper-gold mineralization on its Madhat property near the head of the Mahatta River, southwest of Port Alice. The company ran an induced polarization geophysical survey over a soil geochemical anomaly and drilled five holes, for an aggregate length of approximately 600 metres. The results were disappointing.

Teeta Creek: Great Western Gold Corporation carried out a diamond drilling program on the Teeta Creek property, west of Neroutsos Inlet on Vancouver Island. Ten holes were drilled for an aggregate length of 1000 metres. The holes tested a series of narrow, linear, multi-element soil geochemical anomalies. They located narrow quartz veins in mineralized volcanic rocks.

Rimy Mine: Ange Gold Exploration Ltd. trenched and sampled the surface expression of a narrow (<0.5 m), high-grade, gold-bearing quartz vein at the old Rimy mine near Zeballos. The company has applied for the permits required to reopen the #3 and #4 adits and extract approximately 6500 tonnes of rock containing 900 tonnes of high-grade ore. The ore will be drummed, shipped and custom milled off the property.

Dragon: Noranda Exploration Company, Limited continued to explore the Dragon property north of Gold River on Vancouver Island. It conducted soil geochemical and lithogeochemical surveys and drilled two horizontal diamond-drill holes for an aggregate length of 300 metres. The holes were designed to test for volcanogenic massive sulphide mineralization down-dip from the Falls showing. They intersected weak but significant sulphide mineralization.

Debbie: Whitehawk Ventures Inc. has acquired a four-year lease on Westmin Resources' Debbie property near Port Alberni. Whitehawk plans to extract up to 10 000 tonnes of gold-rich vein quartz from a high-grade ore shoot in

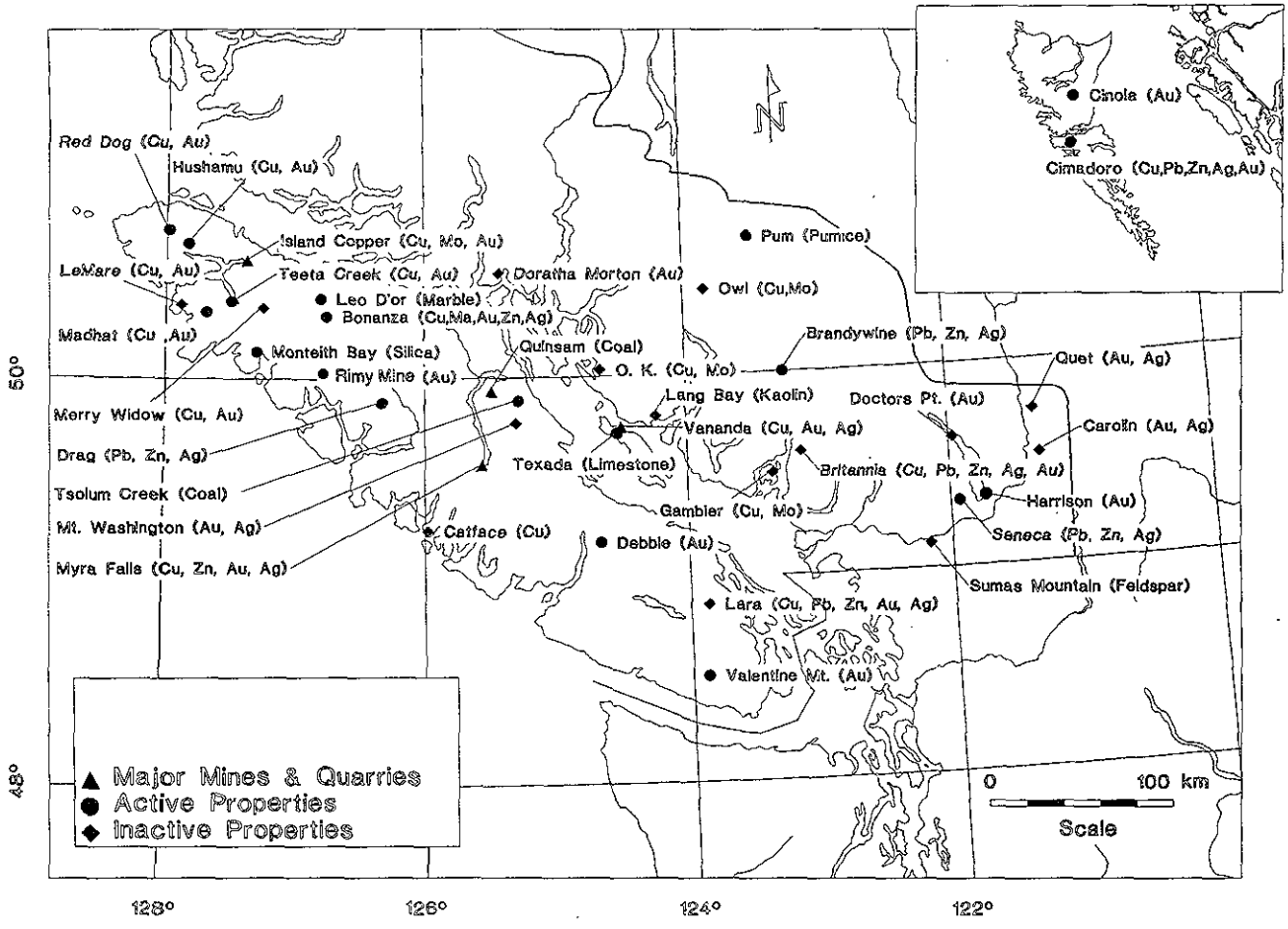

Figure 22. Major exploration projects - Southwestern Region.

the "900 zone". It has driven 167.6 metres of crosscut, 18.3 metres of drift and 15.2 metres of raise, and expects to start mining the vein in the new year. The ore will be custom milled at Westmin Resources' Premier operation, near Stewart.

Tsolum River Coal: Canadian Occidental Petroleum Limited conducted a high-resolution reflection seismic survey (11.5 km) over Nanaimo Group sedimentary rocks, near the Oyster River, south of Parksville. The program was designed to locate coal seams and assess the continuity of the local stratigraphy.

Vananda Limestone: Lafarge Canada Inc. is considering reopening the Vananda limestone quarry on Texada Island. The company drilled a total of 14 diamond-drill holes for an aggregate length of 1280 metres. The holes were sited to assess the quality of the limestone in and around the pit and to determine the location of crosscutting mafic dikes.

Vananda Gold: Vananda Gold Limited completed a winter drilling program southwest of Vananda, on Texada Island. It drilled nine diamond-drill holes for an aggregate length of 3289 metres. The holes tested a flat-lying zone of magnetite-rich copper-bearing skarn formed at the base of the limestone unit underlying the Holnam West quarry. The skarn developed adjacent to a diorite dike.

Bonanza Mine: Braddick Resources Limited cut a grid and conducted geophysical and soil geochemical surveys over an area of polymetallic, precious metal bearing skarn adjacent to the past-producing Bonanza mine, at the south end of Bonanza Lake. The program identified additional exploration targets.

SOUTHERN COASTAL AREA

Several exploration programs were carried out on the Lower Mainland. Some of the more significant include:

Harrison Gold: Pacific Comox Resources Limited drilled two diamond-drill holes, for an aggregate length of 750 metres, on the Harrison Gold property, at the south end of Harrison Lake. A deep hole down the axis of the Jenner stock tested the depth extent of a weak stockwork of gold-bearing quartz veins. A shallow hole explored under a gold-in-soil geochemical anomaly immediately north of the stock. The deep hole encountered veins to a depth of 410 metres. The deposit has a significant nugget effect.

Brandywine: La Rock Mining Corporation continued to explore the Brandywine property near Whistler. The company drilled 38 diamond-drill holes, for an aggregate length of 2839 metres and washed and mapped a strongly deformed lens of polymetallic, lead and zinc-rich massive sulphide exposed in the floor of the Tedi pit.

La Rock is exploring for two types of deposit: volcanogenic massive sulphide in the vicinity of both the Tedi pit and a small zinc showing, hosted by chert and tuff; and shear-hosted gold mineralization in the vicinity of Dave's Pond. It has located a northwesterly trending ductile shear zone that contains zones of locally intense quartz, sericite and carbonate alteration that contain sparse quartz veins carrying appreciable amounts of free gold.

Seneca: Metall Mining Corporation conducted 45.2 line kilometres of time domain electromagnetic geophysical survey (TEM) across the floor of the Chehalis River valley, west of Harrison Lake. The company was exploring for flat-lying lenses of volcanogenic massive sulphide along the projection of a mineralized trend that includes the Fleetwood, Vent and Seneca showings.

Yale: Yale Consolidated Gold Corporation conducted mapping and lithogeochemical programs over a large, low-grade gold deposit within a strand of the Fraser fault, near Boston Bar. The gold is in a quartz-carbonate stockwork that overprints a zone of intense potassic alteration that appears to be related to felsic dike.

Pum: Great Pacific Pumice Inc. extracted, crushed and screened a 1000 cubic metre sample of pumice from its property on the north side of the Lillooet River, north of Meager Mountain. The material was tested for possible stonewash, horticultural and lightweight concrete applications.

QUEEN CHARLOTTE ISLANDS

There was only one major exploration program on the Queen Charlotte Islands in 1993.

Cimadoro: Inco Exploration and Technical Services Limited drilled four diamond-drill holes for an aggregate length of 1000 metres on the Cimadoro property on Moresby Island. The holes were sited to test for polymetallic sedex or volcanogenic massive sulphide mineralization in fine sediment in a "sediment-sill" unit at the stratigraphic base of the Karmutsen formation.

LAND-USE ISSUES

In 1992, the Government of British Columbia announced several initiatives designed to establish a consensus-based approach to land-use decision making. It established a permanent "Commission on Resources and Environment" (CORE) with a mandate to develop and implement a land-use and related resource and environmental management strategy for the province. CORE was requested to deliver a regional land-use plan for Vancouver Island. The commission is expected to report its findings early in 1994. The government also released a map entitled "Toward a Protected Area Strategy for B.C." indicating its intention to increase the amount of protected area in the province.

In June, 1993, the Government released a strategy document entitled "A Protected Area Strategy (PAS) for British Columbia" outlining goals, principles and criteria to guide the selection of additional protected areas. In it, the

government states its intention to protect 12% of the province by the year 2000. The areas selected will meet one of two separate goals. They will include representive examples of the province's natural diversity and will protect special natural, cultural heritage and outstanding recreational features.

The government has established regional inter-agency committees to implement the "study area" selection process. The committees will review existing protected areas and determine the "gaps" that need to be filled to meet PAS goals. The government recognises that some of the study areas proposed in 1992 may not meet PAS criteria for protection and it has asked the regional committees to submit ranked lists of study areas that do. They will determine which of the study areas, and more recently identified "areas of interest", best contribute to filling the "gaps". They will then assess the broad socio-ecomomic, including mining, implications of protecting each of the candidate areas and, taking that information into account, will prepare a revised list of study areas. The process should be completed in 1994.

Cabinet will review the lists and determine which areas should go forward for further study. The regional committees will ensure that all approved study areas are subject to "interim management guidelines". There will be no staking of new claims in some areas and existing tenures will be subject to "enhanced referal" for their "Notices of Work". The guidelines will remain in place until such time as their final status is determined.

Government is committed to a full assessment of the environmental, social and economic implications of protection before any decisions are made. In most instances, area selection will be handled through either regional (CORE) or sub-regional, "Land Resource Management Planning" processes. Land-use committees will arrange for detailed analysis of the merits of each study area to determine which should be selected for protection.

The Ministry of Energy, Mines and Petroleum Resources is involved throughout the land-planning process. It is supplying mineral tenure, geological, mineral deposit and mineral potential data, and "implication rankings", to each of the regional committees revising study area lists. It is also contributing data for more detailed socio-economic studies. The ministry will ensure that affected parties are provided with an opportunity to contribute to the process.

VANCOUVER ISLAND

Protected Area Strategy committees have revised the study area lists for the ecosections on Vancouver Island. They have rated the conservation, recreation, heritage/culture and resource implication (including mining) values of numerous candidate areas and developed priority lists from which protected areas should be selected. The lists were submitted to the CORE Vancouver Island Negotiating Table for analysis.

At a sub-regional level, the provincial government announced a compromise land-allocation plan for the Clayoquot Sound area of Vancouver Island. It placed 33% under full protection, 17% in a "Special Management" zone with extra management guidelines and left the remainder open to normal integrated resource management.

LOWER MAINLAND

The Lower Mainland is not a CORE region and the PAS study area selection process is not so far advanced. Although the PAS committees have completed their "gap analysis", to identify gaps in the existing protected area system, they have not yet completed their identification of candidate areas to review for suitability for protection. Once they have completed this task, they will rate and rank the areas in a similar manner to those on Vancouver Island. The committees should submit a revised list of priority candidates to Cabinet some time in 1994.

There are four, more local, protected area studies ongoing in the Lower Mainland. The Callaghan Lake, Pinecone Lake - Burke Mountain, Tetrahedron and Stawamus Chief "study teams" expect to complete their deliberations and report their findings in the spring.

GOVERNMENT ACTIVITY AND RESEARCH

The Ministry of Energy, Mines and Petroleum Resources is actively involved in the development and implementation of PAS and other land-use processes in the Southwestern Region. It has representatives on most PAS committees and it supplies data and analysis for review and discussion.

The ministry completed a set of 1:250 000-scale Mineral Potential Maps for Vancouver Island and compiled mineral deposit and claim tenure data for submission to Vancouver Island PAS committees and CORE. It is currently working on similar maps for the Middle and Lower Coast regions. They should be completed by the end of March. They will help the ministry to assess the resource potential of study areas and "areas of interest" under Lower Mainland jurisdiction and to establish a "resource implication" ranking for the candidate areas.

The ministry has also been involved in research programs in the region. In 1993, it carried out a multi-faceted project north of Holberg Inlet, at the north end of Vancouver Island. The program included 1:50 000-scale mapping, surficial mapping and geochemical and mineral deposit studies.

The Geological Survey of Canada has also been active in the Southern Coast Mountains (Georgia Bay project). The project will provide modern maps and an improved understanding of both the local stratigraphy and structural evolution of the Coast Mountains.

The Mineral Deposit Research Unit at the University of British Columbia has a project to study volcanogenic massive sulphide deposits in the Canadian Cordillera. New data and understanding of the processes that create deposits such as the Battle zone at Myra Falls, and the Seneca deposit near Harrison Lake, should be of considerable value in future exploration for deposits of this type.

ACKNOWLEDGMENTS

The author wishes to acknowledge the contribution of numerous public sector and industry geologists and other professionals in the creation of this report.

ASSESSMENT REPORTS A SOURCE OF VALUABLE CURRENT AND HISTORIC MINERAL EXPLORATION DATA

By T.E. Kalnins, P. Eng. and A.F. Wilcox, P. Geo.

SUMMARY OF ASSESSMENT WORK, 1993

Results of mineral exploration programs are submitted by the industry to the ministry in compliance with the Mineral Tenure Act Regulations and provide a valuable record of exploration data in British Columbia.

The number of assessment reports submitted and approved in 1993 totalled 478 with declared costs of $17,082,345, a 38% decrease in expenditures from 1992 (Table 9, Figures 23, 24 and 25.

Drilling accounted for 49% of the expenditures, geochemical sampling 18%, geological mapping 13%, geophysical surveys 9%, physical work 7%, and prospecting 2% (Figure 26).

Assessment work, which is required for the maintenance of mineral claim tenure, comprises about half of the overall mineral exploration in the province.

Assessment work credits in excess of those applied to claim tenure may be recorded as Portable Assessment Credit (PAC) and used at a later date. Figure 27 and Table 11 show that claim holders are taking advantage of these banked credits to maintain claim tenure during the current downturn in exploration activity.

Average exploration project costs by work type are shown in Table 10. These values are based on clearly apportioned cost statements including labour, consulting, food, accommodation, transport, camp equipment rentals and supplies, laboratory analyses, report preparation, and direct administration and management of the project.

USING THE DATABASE

Assessment reports are the primary and most current source of detailed technical data available in the public domain. Reports on exploration may be viewed or paper and microfiche copies purchased after expiry of a confidentiality period (usually one year).

The Geological Survey Branch maintains a library of over 23 000 assessment reports dating from 1947. A computer index called ARIS (Assessment Report Indexing System) provides help to users wishing to locate specific information for planning new exploration programs, resource management, land-use studies or geoscience research.

This is a basic bibliographic index sorted by NTS map sheets. For each report the index provides geographic coordinates, claim names, operator, author, type of work reported and report year. Newly computerized, page-size index maps show the approximate centre of exploration reported.

The Assessment Report Index is available on COMFICHE, PAPER printouts and DISKETTES. On diskettes the data fields are enhanced with additional information on geology, mineralization, mining camp and work done. Data on the diskettes are organized as a series of flat ASCII files to facilitate access by commercial software programs.

TABLE 9
SUMMARY OF ASSESSMENT WORK, 1993

NTS	No. of Assessment Reports	Value $	Geological (ha)	Geophysical Airborne (km)	Geophysical Ground (km)	Geochem. No. of Samples	Drilling Core (m)	Drilling Non-core (m)	Prospecting (ha)	Trenching (m)	Access Roads (km)	Line/grid (km)	Tunnelling (m)
82/83	134	2 956 928	28 574	726	620	16 339	13 849	1 132	6 101	530	6	280	
92/102	156	3 812 768	21 901	582	499	18 278	13 817	1 920	11 890	3 267	11	474	
93	77	2 912 526	16 078	2 858	393	13 818	16 056	2 237	1 060	893	7	308	
94	39	2 562 865	25 640	125	193	9 894	10 684	1 392	1 350	--	10	128	
103	11	371 364	8 000	--	30	1 070	910	--	950	--	--	12	
104/114	61	4 465 894	37 172	230	219	13 227	35 954	--	1 750	213	7	157	
TOTALS													
1993	478	17 082 345	137 365	4 521	1 954	72 626	91 270	6 681	23 101	4 903	41	1 359	
1992	616	27 625 329	257 342	5 915	4 273	128 871	126 156	3 748	46 410	12 480	56	2 597	480
1991	1 304	74 379 878	326 022	61 357	9 076	320 505	235 267	22 379	112 943	35 891	170	4 920	1 680

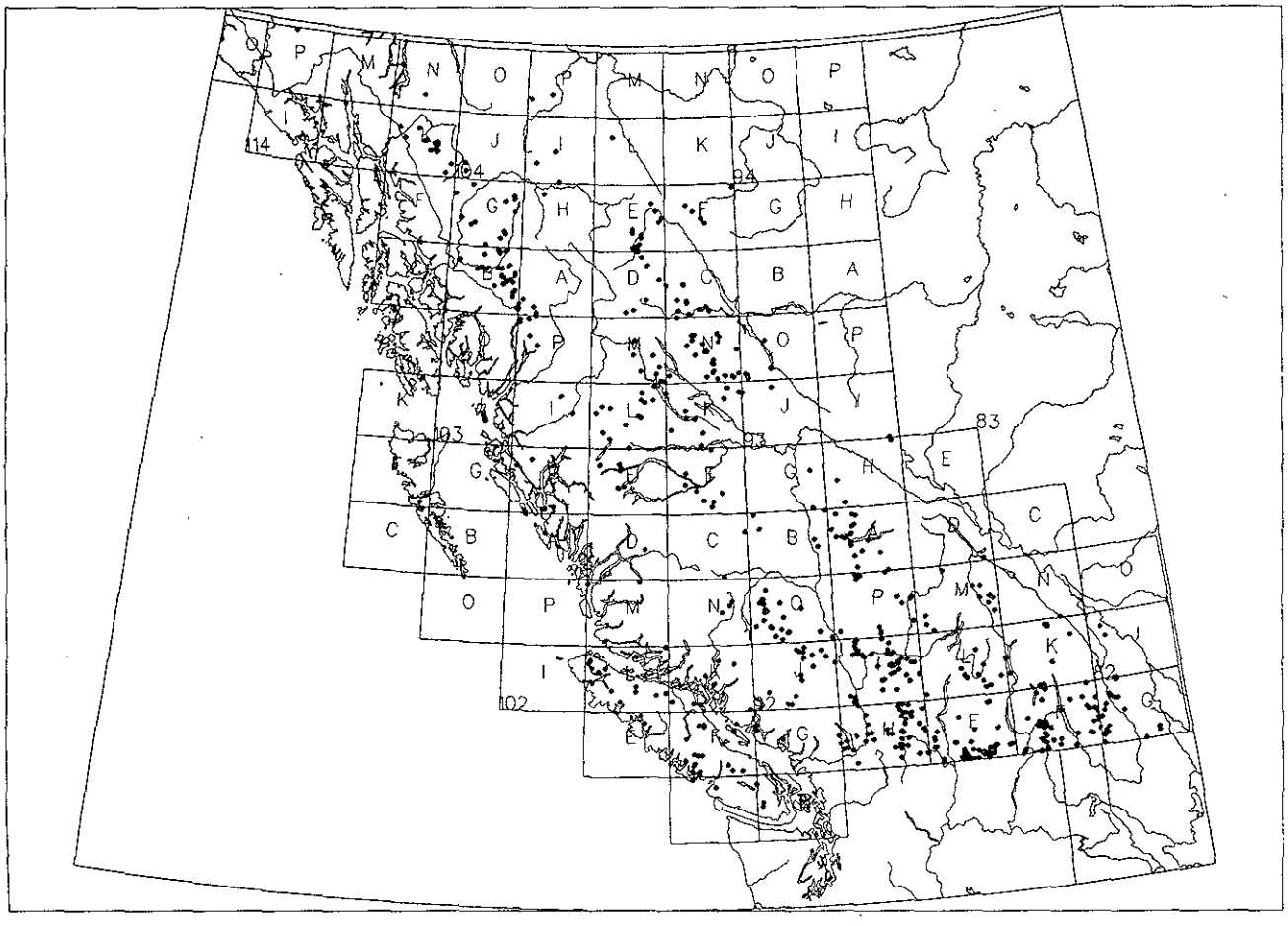

Figure 23. Distribution of assessment work reports in British Columbia, 1993.

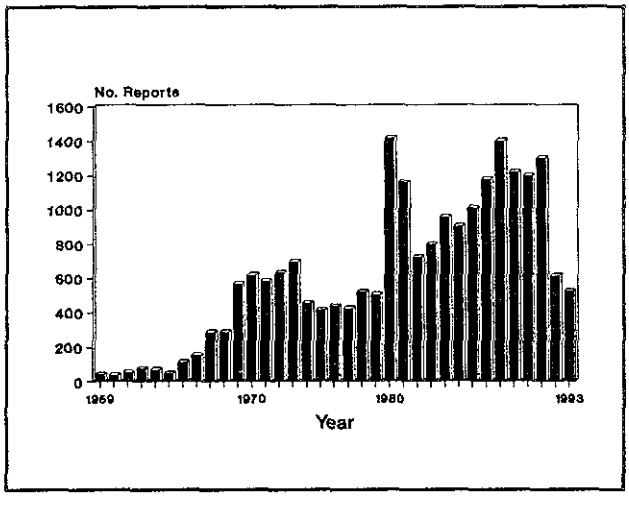

Figure 24. Assessment reports submitted.

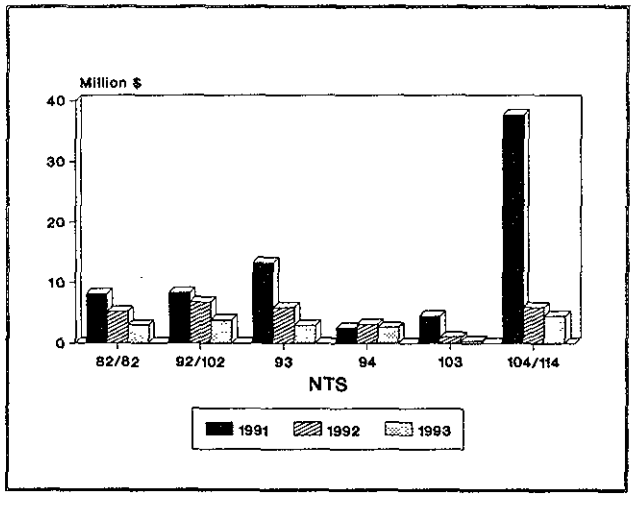

Figure 25. Value of exploration by NTS, assessment reports, 1991-1993.

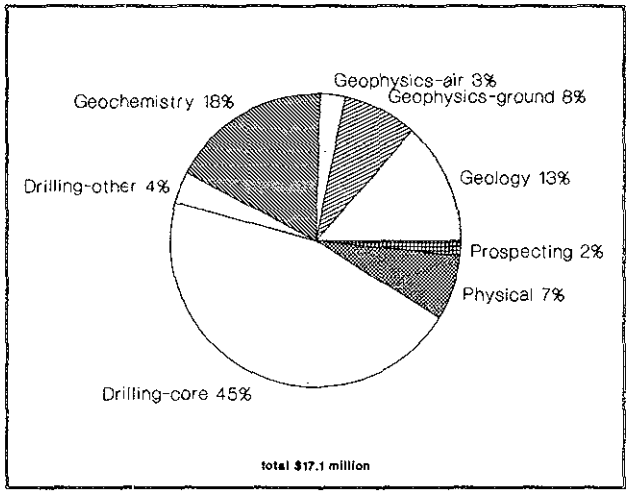

Figure 26. Value of exploration by type of work, assessment reports, 1993.

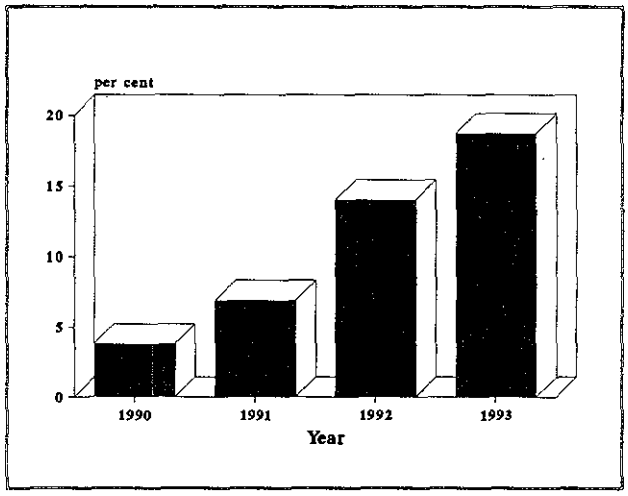

Figure 27. Portable assessment credits used, percent of assessment work.

TABLE 10
AVERAGE EXPLORATION PROJECT COSTS, 1993
($ per unit of work)

TYPE OF WORK	1993	1992	1991
Geological mapping	20/ha	18/ha	18/ha
Petrography	76/sample	105/sample	179/sample
Mag./E.M. airborne	135/km	98/km	97/km
Magnetic, ground	272/km	245/km	138/km
Electromagnetic, ground	607/km	474/km	519/km
Induced polarization	1 702/km	1 098/km	1258/km
Self potential	798/km	784/km	
Soils	31/sample	36/sample	32/sample
Stream sediments	50/sample	82/sample	76/sample
Rock chips	61/sample	72/sample	72/sample
Sampling-assaying	63/sample	34/sample	34/sample
Core drilling	103/m	106/m	128/m
Drilling, non-core	62/m	---	47/m
Prospecting	13/ha	13/ha	10/ha
Line cutting, grid	565/ha	550/km	408/km
Trenching	87/m	48/m	38/m

Year	No. of Companies	No. of Entries	Total Debits	Total Credits	Work Debits	Title (PAC only) Extension
1990	293	615	2 216 956	18 597 635	2 143 956	73 000
1991	355	799	5 110 808	32 519 024	4 795 008	315 800
1992	275	549	4 066 305	15 394 564	3 597 505	468 800
1993	204	411	3 738 216	11 890 103	3 186 416	551 800

The paper index has been updated into five volumes, the first volume consisting of index maps, and four other volumes covering southeastern, southwestern, central, and northern parts of the province.

These products may be purchased directly from:

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Publications Centre
844 West Hastings Street
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Fax: (604) 681-2363

A complete library of original assessment reports is located at the Branch headquarters in Victoria. Partial libraries are located at the Regional Geologists' offices in Smithers, Prince George, Kamloops and Cranbrook. Complete libraries of microfiche assessment reports are available in all Regional Geologists' offices. Partial libraries are maintained in nineteen Gold Commissioners' offices throughout British Columbia. For further information contact:

Geological Survey Branch
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